



FRIDAY, NOVEMBER 26, 1897.

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Contributions.

Handling Freight Trains Partially Equipped with Air.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Following up your admirable editorial on this subject, it may not be amiss to suggest that in making up trains wholly or partly equipped with air-brakes, the empty air-brake cars should be placed in front of the loaded ones, as far as it is practical, and the loaded non-air-brake cars in front of the empty ones. This may not always be convenient on account of traffic condition. But whenever it can be done it will help the engineman to handle the train smoothly, and it may eliminate many break-in-tows and much damage to cars and lading.

E. G.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I cannot agree with E. G. The retardation is the quotient of the mass divided by the retarding force. For the same retarding force (70 per cent. of the light weight of the empty car), the light (or empty) cars are retarded more rapidly than the heavy or loaded cars, which latter, if behind the empties, will jam forward into the empties, which have already somewhat stretched out in restraining the locomotive, and be apt to do damage to the draw gear. Placing light bodies in between heavy ones seems to me to be of very questionable desirability.

R. A. P

An Earthwork Diagram.

Rose Polytechnic Institute, TERRE HAUTE, IND., Oct. 24, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I enclose herewith a diagram for determining the volume of triangular prisms, such as occur in railroad earthwork.

If C represents the base and D the altitude, in feet, of a triangle, the area in square feet is $\frac{1}{2} C \times D$, and if this triangle is the base of a prism 100 ft. long, the volume of the prism in cubic yards is $\frac{100}{54} C \times D = S$.

This is the equation of a straight line, and hence for a given value of C a straight line can be drawn upon cross-section paper having co-ordinates corresponding to the values of D and S .

For example, upon the diagram take the line marked $C = 5$, then for a value of $D = 21.6$, $S = 200$, for a value of $D = 10.8$, $S = 100$, etc. In like manner any other value of C may be represented by a straight line.

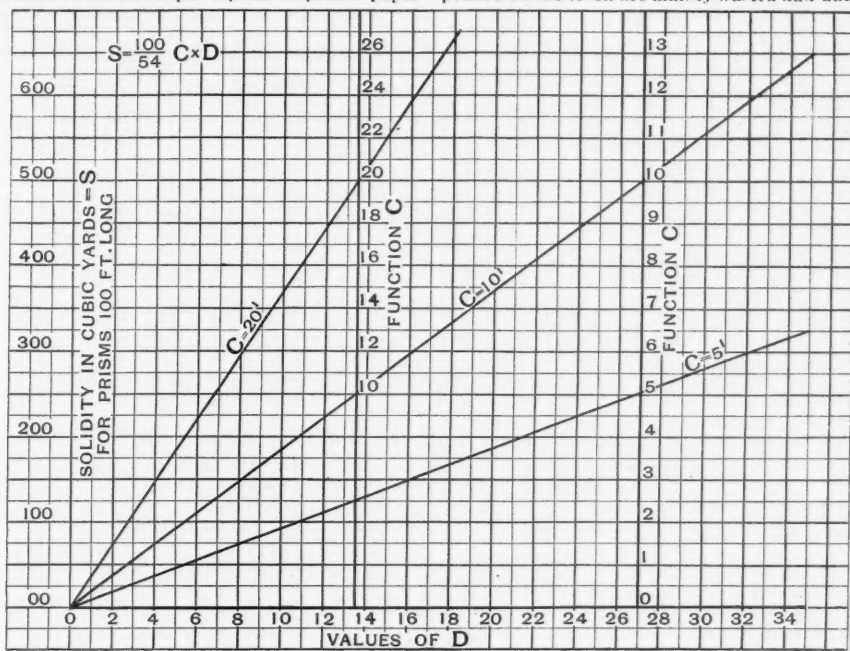
Since in earthwork C has values varying by tenths, it is evident that to draw a line for every value of C likely to occur in ordinary work would produce a confusion of lines making the use of the diagram injurious to the eyes of the operator. This is not necessary, however, since the lines of C cut off equal divisions upon any vertical for corresponding uniform changes in the values of C and also pass through zero; the lines of C may be replaced by a straight edge by merely constructing a scale upon some convenient vertical showing where the different lines of C cross it.

To illustrate the use of the diagram, suppose we have a "three-level" section, as shown in Fig. 2. Let the cut be 4 ft., width of roadbed 18 ft., and the distances out 18 ft. and 15 ft.; then to use the diagram, $C = 4 + 6 = 10$ for side slopes of $1\frac{1}{2}$ to 1, and $D = 18 + 15 = 33$. Entering the diagram where $C = 10$ crosses the vertical where $D = 33$ and following the horizontal from this point to the left, we find 611 cu. yds., which is the volume of a prism 100 ft. long having the section $ABCF$: this must be decreased by the volume of the

prism 100 ft. long, having the section DEF , which is 200 cu. yds., or $611 - 200 = 411$ cu. yds. is the volume of the prism cut.

In preliminary estimates, where the method of end areas is used, the diagram is very convenient, as it can be constructed in the field upon a piece of profile paper

track maintenance bear to the total operating expenses are not as generally recognized as they should be, even by railway officers." I could cite instances, including a Superintendent who is a perfect bane to his roadway men on account of his ideas that labor and money expended on the track are mainly wasted and unnecessary.



Howe's Diagram for Triangular Prisms.

in a few minutes and is applicable to any side slope or width of roadbed.

Three sections to which the diagram lends itself are shown.

MALVERD A. HOWE.

Railway Track and Track Work.

CHICAGO, NOV. 15.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In regard to the review of my book on "Railway Track and Track Work" in the *Railroad Gazette* of Nov. 12, there are a few remarks I would like to make.

Objection is made to the number of detailed descriptions of various track devices, but one of the leading ideas in the preparation of the book was to give copious examples of actual practice on individual railways in different sections of the country, and not merely to speak in a generalizing way of what might, could or should be done. My experience is that many engineers, roadmasters and other railway men . . . are not familiar with the methods and practice in other sections. As the book was intended for general use, special care was taken to make its examples comprehensive and illustrative of practice in all parts of the country.

Objection is also made to certain statements which sound somewhat trite when taken without their context. The book, however, was not written for the man who knows everything, but for the man who is looking for information or instruction. . . . As to your reviewer's statement that railway men are spending \$144,000,000 per year for the maintenance of way and structures, and \$114,000,000 per year for maintenance of locomotives and roll-

He is one of the many men who "assumed that once a railway is built there need be but little work done upon it to keep it in good condition." This gentleman, who is a graduate from the dispatcher's office, and therefore not familiar with requirements of the track department over which he has jurisdiction, considers tie renewals a quite unimportant matter, and he represents a more numerous class of men than your reviewer may think. Again, of two recent railways built to carry a heavy traffic from the beginning, one has 56-lb. rails and high maintenance expenses with a poor track, while the other has 75 and 80 lb. rails with lower maintenance expenses for a much better track. . . .

I appreciate the complimentary concluding remarks of your reviewer, but the comments received from purchasers of the book lead me to believe that readers would much rather have the book complete as it is than have only one-third of the matter contained therein, as suggested in your review.

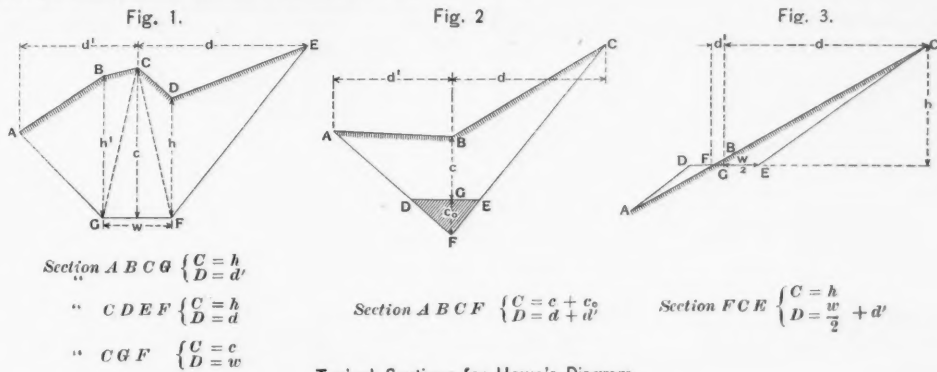
E. E. RUSSELL TRATMAN,
Assoc. Mem. Am. Soc. C. E.

Expansion and Rumbling of Brick Pavements.

PEORIA, ILL., NOV. 16.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The discussion in the columns of your journal regarding expansion and roaring in brick pavements has been read with considerable interest by the writer. The subject is of timely interest, and the various theories expressed as to the causes thereof indicate the absence of data upon these causes, based upon reliable investigation.



Typical Sections for Howe's Diagram

ing stock, it is distinctly stated in the book that such generalized facts and figures are of little use for application to individual cases. This is obvious, since such statistics lump together the roads which spend enough, or too much, with those that spend too little, and they therefore show a very nice average which is entirely misleading. . . . For instance, the returns of a certain road show that the expenditures on maintenance of motive power and rolling stock amounted to \$2,750,000 (34.75 per cent. of expenses) while those of maintenance of way and structures were \$1,500,000 (19.3 per cent. of expenses). This road has some very bad track carrying passenger trains which are widely advertised. . . . This is one of the cases where there is no proper relation between the track and the traffic. . . .

My own personal experience warrants me in upholding the statement that "The importance of the track and track work in their relation to the operation of the railway and the proportion which the expenditures and

It has been proved conclusively in practical construction that paving bricks expand to a considerable degree when exposed to direct heat. The coefficient of expansion of this material, as now made, has never been definitely determined, because it is only within recent years that this factor has been brought directly to the attention of engineers as a disturbing element of sufficient importance to require consideration in construction.

In brick pavement construction no trouble has been experienced from expansion where the interstices have been filled with sand or other material which will allow a slight compression when the paving blocks expand. When, however, the interstices are filled with a Portland cement grout, which not only refuses to yield, but expands with heat, the expansive force becomes sufficiently great to produce rupture.

On Johnson avenue in Newark, N. J., which is paved with fireclay bricks and grouted with Portland cement,

the expansive force became so great that the pavement ruptured with a loud report on May 10, 1896, with the temperature at 94 degrees. The break formed an arch with a 9-ft. span and an 8-in. rise. Regarding this break Mr. Earnest Adams, Engineer of Newark, N. J., makes the following comment in an article read before the American Society of Municipal Improvements in Chicago in 1896, and published in the report of the proceedings for that year:

"The lateral expansion could be traced along the curb line for a distance of 120 ft. in one direction to a street intersection, and for 200 ft. in the opposite one; the cement grout was loosened from the curb. The pressure was so great that a number of bricks were broken, which had been forced out of place, and many showed a horizontal rupture. The difference in the measurement over the top of the arch and its span was .07 of a foot.

"In *Carnegie's Handbook* for 1893, on page 100, is given a table of linear expansion of substances by heat; applying the coefficient of expansion given for firebrick and calculating the linear expansion by taking the difference of temperature between the time of the rupture and when the pavement was laid at 85 deg. (110 deg. - 25 deg.), it singularly produces almost the same result, namely, .081 of a foot.

"No rupture has occurred in any of the other streets, although there are bulgings, but more so in the fireclay than in the shale brick pavements."

A similar rupture occurred in one of the streets in Terre Haute in the last week of July, 1896, as reported in the *Engineering Record* of Aug. 15, 1896. This pavement was on South Sixth street, and consisted of Canton Standard brick, with the interstices filled with Murphy grout. It was laid about 1891, the construction extending into the winter and being completed the following spring. The temperature at the time of rupture was about 100 deg. The rupture consisted of a break at the northwest quarter of the intersection of South Sixth street and Walnut street, the pavement forming an arch about 8 in. in height. After the workmen had removed this raised portion of the intersection, and while the opening was still unfilled, the remaining portion of the intersection on Aug. 6 rose with a loud report from 7 in. to 9 in. high, and extended to the cross-street past the curb line.

These instances prove that there is an appreciable expansion of paving bricks exposed to heat, but there is nothing to indicate that roaring of brick pavements is caused by the expansion lifting the pavement from the sand cushion on which it rests. Rumbling is caused by hollow space beneath the surface, the pavement thus increasing the ordinary noises of traffic to a loud roar. This space may possibly occur beneath the concrete foundation, but the indications are that it is always between the bricks and the sand cushion. There is no case recorded where rumbling has occurred, except when a Portland cement grout was used to fill the interstices. This construction forms a solid masonry arch, the joints of which must become broken before any movement can take place from expansion, and in no instance has this effect been observed except where there was a general rupture. Should the joints become broken by expansion in hot weather, it is fair to presume that the pavement would resume its normal position by contraction in cold weather, and the rumbling caused thereby would cease; but from personal observation such is not the case.

The examples at Newark and Terre Haute proved that the pavement resists the expansive force until it accumulates to such a degree as to cause rupture as a solid body, and that there is no general breaking of the solid arch into small fragments. The arch thus formed by such construction also effectually prevents the gradual adjustment of the surface to the sand cushion, which always occurs where other fillers are used. A slight neglect in thoroughly compacting the sand cushion, negligence in rolling the bricks to a solid bed, or keying the rows up too tightly, may leave a small void between the sand cushion and the lower surface of the bricks. This void may be of the least thickness, but it is sufficient to increase the noise of the traffic on the street and cause what is known as roaring.

A portion of Hamilton street, in the city of Peoria, was paved in 1896 with brick, and the interstices filled with Portland cement grout because of the heavy grade on that portion of the street. In the fall of the same year a rumbling noise was noticed in certain portions of this pavement. An examination showed no breaking of the bond between the bricks or between the bricks and the curbing. The following spring an inspection developed the fact that at several places where this rumbling had occurred there was a settlement of the paving surface. This settlement included spots from 6 ft. to 8 ft. in length and from 2 ft. to 3 ft. in width. The bricks were not sufficiently strong to maintain the arch, and broke along an irregular line in the same manner as a crack in a brick wall, caused by an unequal settlement. Especial care was taken in laying this pavement to roll the bricks to a solid bed, a very heavy roller being used, before the grout was poured into the joints.

The conclusions derived from the instances of expansion and roaring in brick pavements are as follows:

(1) That if an unyielding material be used for filling

the interstices the pavement is liable to rupture as a solid body.

(2) That roaring of brick pavements occurs only when the material used for filling is of sufficient strength to form an arch of the pavement sufficiently strong to support the traffic to which it is exposed.

(3) That roaring in brick pavements is caused by voids between the paving surface and the sand cushion.

(4) That the coefficient of expansion of paving bricks is sufficient to produce an appreciable effect in the pavement.

(5) That provision must be made in brick pavements to allow for the expansion of the material.

(6) That even with the utmost care in construction there is a general adjustment of the paving surface to the sand bed, when completed.

A. D. THOMPSON, *City Engineer.*

The American Society of Civil Engineers.

The old house on Twenty-third street, where the American Society of Civil Engineers has sat for more than 16 years, is now nothing more than any other commonplace building in the great city; henceforward, so long as it endures, it will be merely the abode of the unsanctified. The society has gone to its new home on West Fifty-seventh street. To the boys this is only a delightful change from a dingy old house, with narrow halls



The New House of the American Society of Civil Engineers.

and steep stairs and stuffy rooms and no place to hang your coat, to a beautiful new house with "all the modern conveniences." To the old fellows it means leaving rooms where linger memories of Francis and Welch and Worthen and Holley and a hundred others of the comrades who are gone; rooms where we have had many a stiff debate and many a stupid evening, and where we have seen our best friends grow gray beside us—for a brand new house with electric lights and without a single association or tradition. But the old fellows will have to get used to it, and the boys will begin to make traditions in the new house.

Last Wednesday afternoon and evening the formal opening took place. As we must write before the event we can only say what was to be done and probably was done. The programme of the afternoon included addresses by Major Benjamin N. Harrod, President of the Society; Right Rev. Henry C. Potter, Bishop of New York; Major-Gen. George S. Greene, U. S. A. (retired), Past President of the Society; Col. Julius W. Adams, Past President; Gen. William P. Craighill, U. S. A. (retired), Past President; Dr. J. G. Schurmann, President Cornell University, and the Hon. Joseph H. Choate. In the evening there was to be a house warming and a dance.

The house is really handsome and commodious. The front is shown by the engraving from a photograph. It is in Indiana limestone and was designed by Mr. C. L. W. Eidlitz. On the first floor are reception-room, coat-room and the offices of the Secretary, and a large room intended

for a meeting place for members. On the second floor are the reading-room and audience-room, the latter seating more than 400. On the third floor is space for a museum and model-room, and here are the offices of the clerks. The fourth floor is the stack-room, which has a capacity for over 100,000 volumes. The stacks are of the latest design, being the device of Mr. Bernard R. Green, as used in the new Congressional Library at Washington. An electric book-lift connects the reading-room and the stack-room. In the basement are the janitor's quarters and rooms for storage. The building is steam-heated and lighted by electricity, power being provided by two gas engines of 25 H. P. each.

When, in 1881, the Society purchased the house on East Twenty-third street, which it is now leaving, it had a total membership of 637. The membership now is about 2,100; that is, in 16 years the increase in membership has been 216 per cent. From the data prepared by the Secretary for his history of the Society, published something less than a year ago, we compile the following table, showing the growth in membership by periods of five years:

	Member-ship.	Increase.	per cent.
1870.....	243		
1875.....	492	249	103
1880.....	611	119	24
1885.....	928	317	52
1890.....	1445	517	56
1895.....	1920	475	33
1896.....	2018		

It is probable that the attractions of the new house will promote even a more rapid growth in membership, but that the traditions of the Society are so well formed

that the growth will be not only in numbers, but in weight of scholarship, capacity and achievements, and the Society will, doubtless, remain for many generations, what it is now and always has been, the one society to which every American engineer hopes to belong.

The Space Interval on a Single Track Railroad.

[WITH AN INSET]

The Chesapeake & Ohio Railway has now run trains by space intervals for several years, and the officers of the road express satisfaction with the use of this method of keeping trains apart, even when the number of trains is quite large in proportion to the capacity of the meeting facilities, in other words, the block system is maintained to the fullest extent possible, not only when business is light and long intervals are easy to maintain, but also when a "rush" season comes on.

For the purpose of showing an example of successful working under this method we have procured from Mr. G. W. Lewis, Superintendent of the Cincinnati division of the road, a record of the train movements over his division for one day of 24 hours, when over 500 freight cars were moved each way, and a graphical transcript of this train sheet appears on the inset published herewith.

The record is from midnight of July 14 to midnight of July 15, 1897. The Cincinnati division is 139 miles long between freight terminals, and trains are managed from Cincinnati by a Chief Dispatcher and three assistants, the assistants working eight hours each.

Trains No. 1, 2, 3 and 4 are through passenger, first class. Numbers 15, 16, 17, 18, 19 and 20 are local passenger, second class; 95 and 99 are fast freight, second class and 90 and 98 are fast freight, third class. Numbers 63, 64, 65 and 66 are local freight. Eastbound trains, Cincinnati to Russell, have right of track over westbound trains of the same class.

The average time used by through freight trains was 10 hours 22 minutes. No. 95 took the shortest time, using 6 hours 35 minutes; third No. 77 the longest time, 12 hours 35 minutes. There were 11 through freight trains east, handling 525 cars; and 16 through freight trains west, with 580 cars.

Permissive blocking was availed of in three instances. Second No. 76 was given a caution card at Dayton, on account of No. 66, local freight, being in the block, and to allow second No. 76 to pass No. 66 at Brent. Third No. 76 was given a caution card at Foster, on account of No. 66 being in the block and to allow third No. 76 to pass at Wellsburg. No. 66 was allowed to run on a caution card to Augusta, so as to let No. 77 leave there on the arrival of No. 2. No. 98 received a card at Quincy on account of No. 64, local freight, being in the block and to allow No. 98 to reach Glenn for No. 17, and to pass No. 64.

First No. 76 was held at Gray's Branch and second No. 76 at Zion, to let No. 99 and first No. 71 out of Russell, the yard there being somewhat congested.

Train 63 waited for passenger train 15 at Greenup, a non-telegraph office; trains 15 and 18 met at South Ripley; 15 and first 90 at Carntown; 73 and 76 met at Oneonta, and also 66 and 75 at the same station. In each of these cases the trains had a telegraphic order permitting them to meet at these non-telegraph stations.

The chief train dispatcher of this division is Mr. C. M. Freeman; G. H. Fisher is dispatcher from 7 a. m. to 3 p. m.; E. H. Edsall from 3 p. m. to 11 p. m., and J. C. Eby from 11 p. m. to 7 a. m.

The Sargent Brakeshoe Tests at Wilmerding.

In our issues of Sept. 24 and Oct. 1 we described the new "Diamond S" brakeshoe of the Sargent Company. Sufficient interest has been taken in this new brakeshoe to warrant the company in making rather complete road and laboratory tests. The service tests were made on various railroads to determine the wearing qualities and the general practicability of this style of brakeshoe,

ing-pressures of 10,733 lbs., 6,750 lbs. and 2,798 lbs. The heaviest braking pressure represents heavy passenger service; the pressure 6,750 lbs. medium passenger service while 2,798 lbs. corresponds to ordinary freight service.

Brakeshoes.—The brakeshoes used were of the M. C. B. standard dimensions. Before making tests, of which a record was taken, the face of each shoe was turned or ground to approximately fit the test wheels, after which the shoe was brought down to a full bearing by repeated applications from speed. The test wheels are without taper and approximately 33 in. in diameter. Each shoe tested was given a number as follows: Shoe No. 2, soft "Diamond S"; shoe No. 4, plain soft cast iron; shoe No. 6, hard "Diamond S"; shoe No.

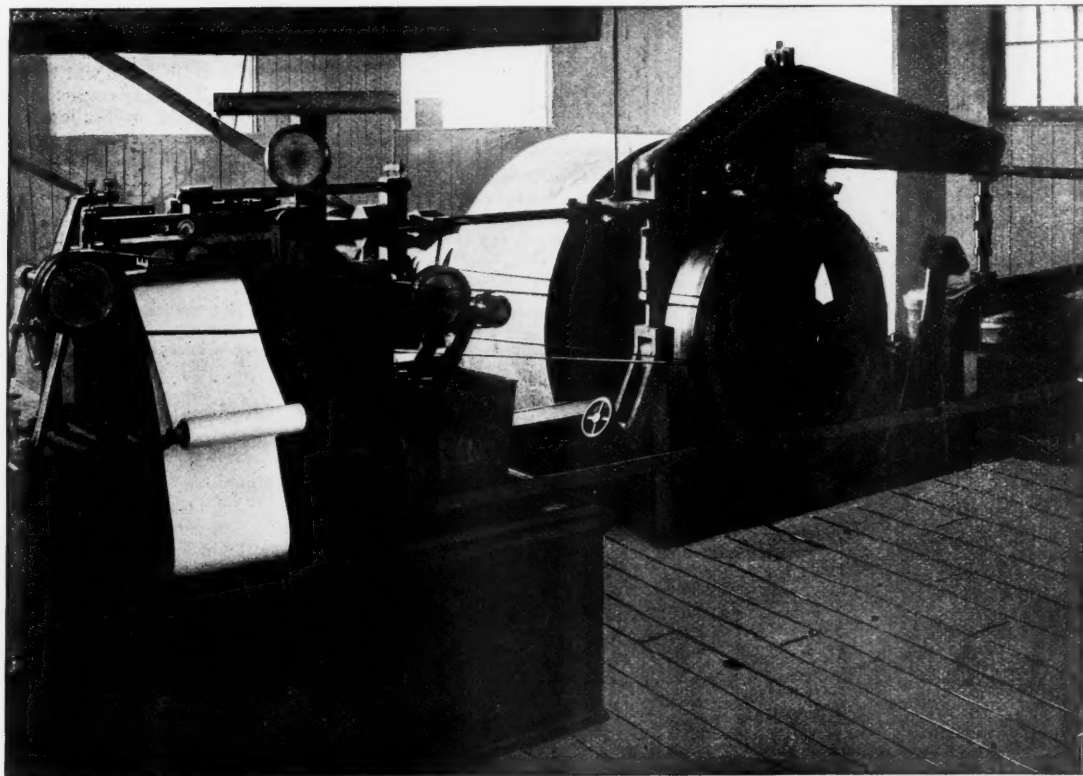
The comparison of the tests made on steel-tired and chilled wheels shows that the difference between the average mean co-efficients of friction obtained with the same shoe upon the two wheels, are slightly higher in the case of the chilled wheel, excepting shoe No. 2 at 40 miles an hour initial speed, and 2,798 lbs. braking pressure, where the higher average was got on the steel wheel. The differences in the average mean co-efficients of friction from the two wheels, however, are not as much as often exist between individual tests. It would appear, therefore, that practically the same results could be expected so far as friction is concerned, from steel-tired and chilled wheels, with shoes similar to those tested.

A comparison of the co-efficients of friction given by the soft and hard "Diamond S" brakeshoes (Nos. 2 and 6) shows generally greater friction for the soft shoe, being most apparent at the heavy pressure tests from an initial speed of 65 miles per hour and throughout all of the tests at 40 miles per hour. The results with the two shoes at 2,798 lbs. braking pressure and initial speed of 65 miles per hour are practically the same.

Comparing the hard "Diamond S" shoe No. 6 and the plain hard cast iron shoe No. 7 in all tests, the shoe with the expanded steel gave higher mean co-efficients of friction. Tests on the steel-tired wheel with the soft "Diamond S" shoe No. 2 gave higher mean co-efficients than the plain soft cast iron; on the chilled wheel at 2,798 lbs. braking pressure and 40 miles per hour initial speed, the results obtained with the two shoes were practically the same, but at the same speed and 6,750 lbs. braking pressure the plain soft iron gave higher mean co-efficients.

The steel appears to increase somewhat the frictional qualities of very hard cast-iron brakeshoes, but when soft cast iron is so used the addition of the expanded steel does not materially affect the friction, the results not showing a uniform tendency either to raise or to lower the mean co-efficient.

To show the relations which the present tests bear to those made by the M. C. B. Association, Figs. 2 and 3 are presented. In these diagrams



The M. C. B. Brakeshoe Testing Machine.

while the laboratory tests gave data concerning the friction.

In the road tests usually one truck of a car was equipped with "Diamond S" brakeshoes, while the other truck was fitted with a different shoe, with which it was desired to make comparison. In some cases where certain cars were always run together in the same train, such as in local passenger service, one car was equipped fully with "Diamond S" brakeshoes, while other shoes were used for the remaining cars.

The road tests show that these shoes wear slightly longer than chilled iron shoes in the same service, and that the life is about four times that of the ordinary, plain cast-iron shoes. In a number of the road tests "Diamond S" brakeshoes were used with steel-tired wheels, and no cutting of the tires was reported. The cutting of steel tires has been one of the chief objections to the use of Congdon brakeshoes with steel wheels.

So little can be learned from road tests regarding the friction of brakeshoes, that to get information on this point shop tests of the "Diamond S" shoe were made on the brake shoe testing machine at the Westinghouse Air Brake Company's works, Wilmerding, Pa. This is the same apparatus as was used by the Committee of the Master Car Builders' Association in their tests during 1895 and 1896. The present tests were conducted for the Sargent Company by a disinterested engineer who had worked with the testing apparatus under the direction of the M. C. B. Committee, and collected the greater part of the data contained in the report of 1896. Any errors, therefore, which might be introduced through the personal equation of the operator were probably eliminated.

The direct object of the tests was, first, to determine under several sets of conditions, the co-efficients of friction of "Diamond S" brakeshoes cast from both soft and hard iron; second, to obtain results under similar conditions, for soft and hard plain iron shoes cast at the same time, and from the same metal, as the "Diamond S" brakeshoes; third, to have the conditions of initial speed, braking pressure, and methods of conducting the tests, the same as those used by the M. C. B. committee, as representing passenger and freight service. The present tests can be fairly compared, one with another, and also a comparison can be made directly with the results of the M. C. B. laboratory tests where various brakeshoes were tried.

Experience with the testing machine has shown that results can be duplicated with reasonable accuracy, provided the conditions under which the tests are made are practically the same. For which reason three tests made under similar conditions, are, as a rule, sufficient to give a correct indication of the co-efficient of friction.

The hard and soft "Diamond S" brakeshoes were tested at initial speeds of 65 and 40 miles per hour, with break-

7, plain hard cast-iron. Duplicate shoes were furnished in case any of the original test shoes should become unfit to use. These duplicate shoes, however, were not needed and were not tested.

Judging from the time required to grind the several shoes to a good bearing by means of repeated applications to the test wheels, it is believed that shoes Nos. 2 and 4 are of harder iron than the soft cast-iron shoes used in the M. C. B. tests, and shown in the report as the A shoe. Also, that shoes Nos. 6 and 7 are of harder iron than the hard cast-iron shoes shown as B shoes in the same report. In the same way it would appear that shoes Nos. 3 and 4 are approximately of the same hardness as the hard cast iron shoes (B) of the M. C. B. tests.

Wheels.—The test wheels used were one chilled iron wheel and one steel-tired wheel with spoked centers, being the same ones used in the M. C. B. tests. The circumference of the chilled wheel was 103.5 in., while that of the steel-tired wheel was 103.3 in. As mentioned above, the apparatus used in making the tests was that used by the M. C. B. committee, and it is illustrated by the accompanying engraving. A linedrawing and description of the machine was given in the *Railroad Gazette*, August 21, 1896, and, therefore, we will not repeat what was published at that time.

It should be borne in mind that all tests made with this apparatus correspond to emergency applications where the full braking pressure is suddenly applied, and maintained throughout the stop. At the beginning of the tests both the steel-tired wheel and chilled test wheel were in good condition, the surface of the chilled wheel being smooth while that of the steel-tired wheel had been faced up since the last tests.

Results.—A summary of results of the different tests is given by the accompanying tables, but the results are best set forth by the graphical method as shown in Fig. 1. In these diagrams the average mean co-efficients of friction in per cent. are plotted as ordinates with the braking pressure in pounds, as abscissae. The small circles represent the average mean co-efficients of the several groups of tests.

each vertical line represents a shoe; the average mean co-efficients of friction which have been obtained on the testing machine at the limiting conditions of pressure determine the ends of the heavily shaded portions of the vertical line. The upper end of the line represents results obtained with the lightest pressure; the lower end represents results obtained with the heaviest pressure; points between the ends represent results which could be got by using braking pressures lying between the limits. Fig. 2 shows the range of variations of the average mean co-efficients of friction between the limits of 2,798 lbs. and 10,733 lbs. braking pressure and 65 miles per hour initial speed on both steel-tired and chilled wheels. Fig. 3 shows similar results between the limits of 2,798 lbs. and 6,750 lbs. braking pressure and 40 miles per hour initial speed.

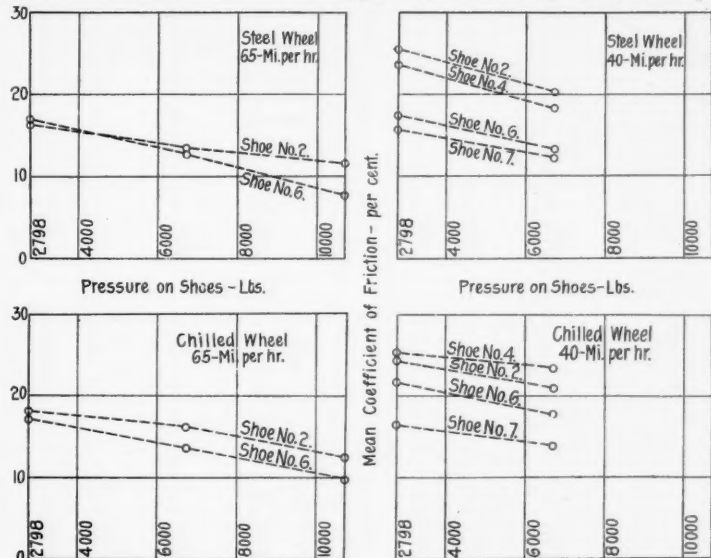


Fig. 1.—Certain Results of the Sargent Brakeshoe Tests.

As was previously mentioned, there is reason to believe that the B shoe of the M. C. B. tests is of about the same hardness as shoe No. 2, and that shoe A of the M. C. B. tests is of a quality of cast iron not commonly used in service and softer than shoe No. 2.

The friction given by shoes Nos. 2, B, C and H is about the same, while the friction of shoes Nos. 6 and 7 is less than any of the others. It is to be regretted that there are not sufficient data at hand to furnish a similar comparison with chilled iron, which is the extreme condition for hard iron brakeshoes.

Observations.—The following are some of the more important points noted during the tests:

During the tests from high initial speeds, the steel tire is slightly roughened by the "Diamond S" shoe by small pieces of steel sticking to the face of the wheel. This action is more pronounced with the soft "Diamond S" shoe than with the hard. When the face of the wheel is in this roughened condition a few tests with

pieces during such tests flow from the shoe, and at which times they are heated to redness in places along the surface.

TABLE OF RESULTS—SARGENT BRAKESHOE TESTS.
Tests of 13 in. Brakeshoes on Chilled Wheel.

Date, 1897.	No. of test.	Shoe No.	Pressure on shoe, lbs.	Initial speed, miles per hour.	Travel of wheel, ft.	Mean pull on shoe, lbs.	Mean C. of F., per cent.	C. of F. near beginning, per cent.	C. of F. 15 ft. from end, per cent.
Nov. 1.	1	No. 2 (Soft "Diamond S")	10733	65.19	1178.9	1499.5	13.47	11.35	22.30
	2	"	65.19	1457.2	1197.3	11.16	11.25	22.11	
	3	"	64.74	1246.3	1312.2	12.73	13.38	23.47	
Average	3		65.04	1291.1	1306.3	12.41	11.99	22.63	
Oct. 30.	1	2	6750	65.19	1656.3	1010.0	14.36	16.97	27.45
	2	"	65.19	1549.5	1081.7	16.03	17.43	30.85	
	3	"	65.19	1429.5	1167.3	17.29	17.58	27.76	
Average	3		65.19	1543.3	1086.3	16.49	17.33	28.68	
Oct. 30.	1	2	6750	40.91	447.1	1381.8	20.47	22.67	29.30
	2	"	40.91	428.6	1452.3	21.52	23.90	31.61	
	3	"	40.91	448.4	1391.6	20.62	22.67	29.61	
Average	3		40.76	441.0	1408.6	20.87	23.08	30.17	
Oct. 30.	1	2	2798	65.19	2960.5	507.4	18.13	24.55	38.69
	2	"	65.04	3051.7	476.9	17.04	21.95	38.69	
	3	"	66.00	2882.2	529.6	18.93	22.70	33.48	
Average	3		65.64	2964.8	504.6	18.03	23.07	36.95	
Oct. 30.	1	2	2798	49.11	839.4	674.8	24.12	26.04	33.86
	2	"	40.91	854.6	702.8	25.12	29.76	31.62	
	3	"	40.46	919.9	643.4	23.00	26.04	34.23	
Average	3		40.76	871.3	673.7	24.08	27.28	33.24	
Nov. 1.	1	No. 4 (Plain soft)	6750	40.91	308.9	1506.8	23.66	26.62	33.15
	2	"	41.30	409.2	1000.7	23.71	26.22	31.93	
	3	"	40.91	428.6	1481.6	21.99	23.28	30.23	
Average	3		41.06	409.9	1560.7	23.12	25.34	31.77	
Nov. 1.	1	4	2798	41.36	913.3	693.8	24.80	21.21	39.07
	2	"	40.91	896.8	667.5	23.86	21.21	38.32	
	3	"	40.91	830.1	740.0	26.45	22.69	41.67	
Average	3		41.16	880.1	700.4	25.04	21.70	39.69	
Nov. 1.	1	No. 6 (Hard "Diamond S")	10733	65.19	1536.3	1058.5	9.86	9.70	18.72
	2	"	65.19	1556.1	1043.3	9.72	8.63	20.37	
	3	"	65.19	1490.1	1101.6	10.26	9.66	20.37	
Average	3		65.19	1527.5	1067.9	9.95	9.30	19.82	
Oct. 29.	1	6	6750	65.19	1826.5	916.6	13.58	13.11	24.90
	2	"	65.19	1767.2	908.2	13.45	12.34	24.44	
	3	"	65.19	1740.8	909.0	13.47	12.49	27.30	
Average	3		65.19	1664.2	956.9	14.18	13.57	26.99	
Oct. 30.	1	6	6750	40.46	506.4	1169.8	17.33	17.12	27.91
	2	"	40.46	491.2	1183.5	17.63	17.29	27.91	
	3	"	40.91	473.5	1235.3	18.30	18.70	30.51	
Average	3		40.61	490.4	1196.2	17.73	17.53	28.74	
Oct. 30.	1	6	2798	65.19	2958.0	478.5	17.09	18.97	33.85
	2	"	66.09	2761.6	519.2	18.56	18.97	36.46	
	3	"	65.19	3023.2	447.1	15.98	18.97	33.85	
Average	3		65.49	2914.3	481.6	17.21	18.97	34.72	
Oct. 30.	1	6	2798	40.46	902.1	583.7	20.86	21.21	33.48
	2	"	40.91	895.5	604.1	21.59	21.21	33.85	
	3	"	40.46	896.8	653.0	22.62	23.06	37.20	
Average	3		40.61	898.1	606.9	21.69	21.83	34.84	
Nov. 1.	1	No. 7 (Plain hard)	6750	40.91	600.7	951.9	14.10	14.80	25.17
	2	"	40.46	639.6	891.8	13.21	11.72	27.61	
	3	"	40.91	692.4	947.8	14.04	12.95	27.61	
Average	3		40.76	644.3	930.5	13.78	13.16	26.79	
Nov. 1.	1	7	2798	40.91	1275.9	442.7	15.82	13.02	29.02
	2	"	41.36	1171.7	470.4	16.81	14.88	29.39	
	3	"	40.91	1175.0	442.2	15.80	14.88	30.20	
Average	3		40.46	1237.8	467.3	16.71	15.63	29.76	
Oct. 30.	1	7	2798	40.46	1221.2	455.9	16.29	15.25	31.25
	2	"	40.46	1186.8	495.0	17.69	16.74	30.50	
Average	3		40.76	1211.4	462.3	16.52	15.07	30.02	

the "Diamond S" shoe at low initial speeds and light braking pressures gives the steel tire a fairly smooth surface.

The "Diamond S" shoes give the chilled test wheel a smooth surface, and especially is this true of the hard "Diamond S" shoe. The plain, soft, cast-iron shoe slightly roughens the surface of the chilled wheel.

During the stops from initial speeds of 50 miles an hour, using the lightest braking pressure, 2,798 lbs., there is a tendency for the steel in the "Diamond S"

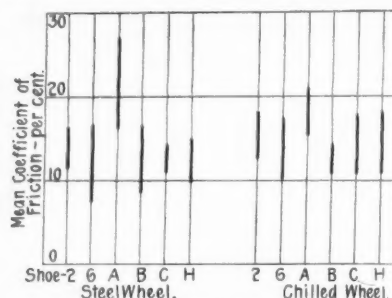


Fig. 2.—Range of Variation of the Average Mean Coefficient of Friction between the Limits of 2,798 lbs and 10,733 lbs. Braking Pressure. Initial Speed, 65 Miles per Hour, Constant.

brakeshoe to flow, covering the cast-iron portions of the shoe; below this speed the steel strands retain their form well. With heavy pressure tests and initial speeds above 50 miles per hour, the steel flows and forms a thin coating over the entire face of the shoe. Thin steel

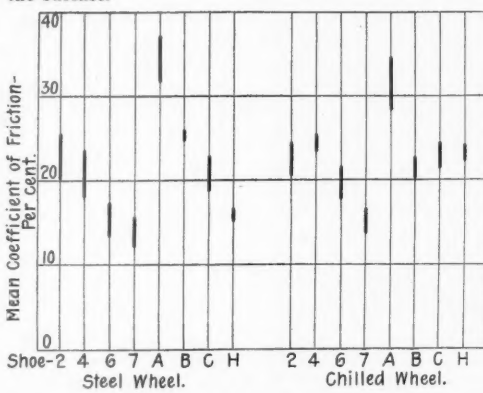


Fig. 3.—Range of Variation of the Average Mean Coefficient of Friction between the Limits of 2,798 lbs and 6,750 lbs. Braking Pressure. Initial Speed, 40 Miles per Hour, Constant.

TABLE OF RESULTS—SARGENT BRAKESHOE TESTS.
Tests of 13-inch Brakeshoes on Steel-Tired Wheel.

Date 1897.	No. of Test.	Shoe No.	Pressure on shoe, lbs.	Initial speed, miles per hour.	Travel of wheel, ft.	Mean pull on shoe, lbs.	Mean C. of F., per cent.	C. of F. near begin- ning, per cent.	C. of F. 15 ft. from end, per cent.
Oct. 27.	1	No. 2 (Soft "Dia- mond S")	10733	65.19	934.4	1711.7	15.95	19.59	22.79
	2	"	"	65.19	1569.4	967.0	9.01	9.26	17.94
	3	"	"	65.19	1486.9	1072.0	9.99	10.67	19.40
Average	3			65.19	1330.2	1250.2	11.65	13.15	20.04
Oct. 26.	1	2	6750	65.19	1331.0	1024.8	15.18	20.82	20.81
	2	"	"	65.19	1916.2	749.4	11.10	12.03	22.83
	3	"	"	65.19	1728.9	806.5	13.28	16.50	21.56
	4	"	"	65.19	1589.2	980.0	14.52	16.97	26.21
Average	3			66.09	1567.1	852.4	14.11	16.26	23.96
Oct. 25.	1	2	6750	65.37	1066.1	920.6	13.63	16.50	23.07
	2	"	"	40.46	395.6	1504.2	22.29	25.30	27.76
	3	"	"	40.46	431.9	1366.7	20.25	22.36	28.07
Average	3			40.46	488.0	1229.0	18.21	21.59	26.99
Oct. 26.	1	2	2798	40.46	377.8	1369.0	25.25	23.08	27.61
	2	"	"	65.19	3387.0	433.6	15.50	22.32	29.76
	3	"	"	65.19	3316.9	433.2	15.48	14.88	29.76
	4	"	"	65.19	2909.2	435.3	15.56	18.60	29.76
Average	3			65.64	3368.5	398.6	14.25	16.74	29.02
Oct. 25.	1	2	2798	65.19	3243.0	417.9	14.91	18.60	32.74
	2	"	"	65.19	3066.1	498.5	17.82	21.58	34.97
	3	"	"	65.19	2891.5	532.3	19.03	22.69	32.36
Average	3			65.22	3226.0	419.9	16.08	19.34	31.19
Oct. 25.	1	2	2798	40.46	761.6	708.0	24.30	26.04	34.60
	2	"	"	40.46	774.8	708.8	25.33	26.04	32.36
	3	"	"	40.46	738.6	716.6	25.61	27.9	35.35
Average	3			40.46	758.3	711.1	25.41	26.66	34.10
Oct. 29.	1	No. 4 (Plain Soft)	6750	40.46	524.2	1121.0	16.61	15.42	26.99
	2	"	"	40.46	511.0	1266.3	17.87	18.51	26.99
	3	"	"	40.46	478.1	1329.4	19.70	17.74	26.99
Average	3			40.46	504.4	1218.9	18.06	17.22	26.99
Oct. 29.	1	4	2798	40.46	1112.3	517.8	18.51	16.74	33.48
	2	"	"	40.91	886.9	618.7	23.18	22.30	33.48
	3	"	"	40.91	923.2	619.2	25.61	27.90	37.20
Average	3			40.91	933.2	807.0	28.84	26.04	38.32
Oct. 29.	1	No. 6	6750	40.80	913.9	655.7	23.43	21.38	35.62
	2	"	"	65.19	1810.0	753.9	7.02	7.37	14.66
	3	"	"	66.54	1879.2	805.8	7.51	7.27	16.97
Average	3			65.64	1864.1	804.3	7.49	7.11	15.51
Oct. 25.	1	6	6750	65.19	1757.2	827.7	12.26	12.80	21.90
	2	"	"	65.19	1712.3	871.0	12.90	11.88	22.65
	3	"	"	65.19	1717.0	900.2	13.33	14.19	21.36
Average	3			65.19	1728.5	866.3	12.83	12.96	22.77
Oct. 25.	1	6	6750	40.91	592.1	852.1	12.62	11.88	22.36
	2	"	"	41.38	580.9	953.6	14.13	13.42	22.68
	3	"	"	40.46	619.2	872.5	12.93	13.57	21.13
Average	3			40.91	597.4	892.7	13.23	12.96	22.06
Oct. 25.	1	6	2798	65.19	2918.5	458.6	16.39	16.37	31.25
	2	"	"	65.19	2627.8	489.5	17.50	15.63	30.88
	3	"	"	65.19	2717.5	458.8	16.40	16.74	28.65
Average	3			65.19	2734.6	468.9	16.76	16.25	30.26
Oct. 25.	1	6	2798	40.46	1005.6	442.3	15.81	12.65	29.76
	2	"	"	40.46	933.0	491.5	17.56	14.88	30.13
	3	"	"	40.46	958.1	510.8	18.25	17.40	27.90
Average	3			40.46	965.6	481.5	17.21	15.01	29.26
Oct. 23.	1	No. 7 (Plain Hard)	6750	40.46	662.0	835.7	12.38	10.79	22.36
	2	"	"	40.46	677.2	815.0	12.67	10.05	23.90
	3	"	"	40.46	613.2	885.4	13.12	11.57	21.59
Average	3			40.46	710.9	772.5	10.99	9.87	22.36
Oct. 23.	1	7	2798	40.46	665.8	827.1	12.14	10.56	22.55
	2	"	"	40.46	1084.0	425.5	15.21	14.14	29.76
	3	"	"	40.46	1071.5	437.5	15.63	12.65	31.62
Average	3			40.91	1074.8	459.8	16.43	14.88	29.76
	4	"	"	40.61	1076.8	440.9	15.70	13.89	30.30

Both sets of engines (high and low pressure) are fitted with the Heusinger gear for operating the valves, which are all of the American type, and placed on top of the cylinders. The reversing of the two sets is accomplished by means of one rod, as the two reversing shafts are connected rigidly together. The exhaust steam from the low-pressure steam chests goes through cast iron cross-pipes to a copper pipe that runs forward to the smokebox and into the main blast nozzle. The locomotive is equipped with Westinghouse brake, applied to the second and third pairs of drivers, also with an air-pressure sanding device and a Siemens & Halske electrical speed recorder.

A table of dimensions follows:

Diameter high-pressure cylinders (2).....	15 in.
low.....	24 in.
Stroke of pistons.....	26 in.
Cylinder ratio.....	1:2.57
Diameter driving wheels.....	64 in.
truck.....	33 in.
Driving wheel base.....	12 ft. 1 1/2 in.
Total.....	26 ft. 3 1/2 in.
Diameter of boiler at smallest ring.....	55 in.
194 tubes, 1 3/4 in. inside diam.....	13 ft. 5 1/2 in. long.
Steam pressure.....	191 lbs. per sq. in.
Grate surface.....	26.9 sq. ft.
Firebox heating surface.....	105.5 "
Inner surface of tubes.....	1277.6 "
Total heating surface.....	1383.1 "
Weight on driving wheels.....	92,600 lbs.
Total weight in working order.....	129,000 "

Tandem Compound Freight Locomotive, by A. G. Krauss & Co., Munich.—The consolidation type of locomotive has been used to a considerable extent in Europe of late years, and the Bavarian State Railroads have recently built a number of them, alike in general, but different in certain minor features. The one shown at Nürnberg (Fig. 4) is very much like American consolidation engines, and it is a four-cylinder tandem compound. The high and low pressure pistons on each side are fastened to the same rod, the former being 1 1/2 in. in diameter on one side and 1 5/8 in. on the other. This discrepancy is due to the fact that the forward side of the high pressure piston is extended into a tube on the end of which is formed the low-pressure piston. As can be seen by the illustration (Fig. 12), an ingeniously designed slide valve controls and distributes the steam to the two cylinders, and the details have been so carefully worked out that the tandem cylinders with their valve chest are remarkably compact, and the appearance of the front end of the locomotive is very good, all things considered. The connecting rod is connected to the third driving axle, and the valve motion, of the Heusinger type, is actuated by a very long rod pivoted to a return crank on the rear driving crank pin. Some of the engines have been built with the front truck placed just back of the cylinder saddle, giving a slightly shorter wheel-base than that of the Exposition locomotive. In this case also they make the second driving axle the main one, enabling them to use a shorter connecting rod than in the other design.

A table of dimensions follows:

Diameter high-pressure cylinder.....	14 1/2 and 15 1/2 in.
low.....	28 in.—14 1/2 in. and 28 in.—15 1/2 in.
Stroke of piston.....	22 in.
Diameter of driving wheels.....	45 1/2 in.
Wheel base.....	14 ft. 1 1/2 in.
Total wheel base.....	22 ft. 11 1/2 in.
Straight top boiler, pressure.....	195 1/2 lbs. per sq. in.
Diameter outside smallest ring.....	63 in.
229 tubes, 1 3/4 in. inside diameter.....	14 ft. 9 1/2 in. long.
Grate surface.....	26 sq. ft.
Firebox heating surface.....	121.6 sq. ft.
Inner tube.....	1602.7 sq. ft.
Total.....	1724.3 sq. ft.
Weight on driving wheels.....	123,370 lbs.
Total weight in working order.....	145,000 lbs.

Four-Wheel Tank Locomotive, A. G. Krauss & Co.—This locomotive, shown in Fig. 7, was designed for narrow gauge or light traffic railroads. Water is carried in side tanks and also underneath the boiler, between the frames, as the cylinders are outside connected.

The principal dimensions follow:

Diameter of cylinders.....	10 1/2 in.
Stroke.....	15 1/2 in.
Diameter of drivers.....	32 in.
Boiler pressure.....	170 1/2 lbs. per sq. in.
Diameter of boiler.....	38 1/2 in.
Grate surface.....	5.8 sq. ft.
Total heating surface.....	578.4 sq. ft.
Weight in working order.....	36,800 lbs.
Water capacity.....	649 gals.
Coal space.....	34.2 cu. ft.

Eight-wheel Four-cylinder Compound Locomotive (Mallet System), built by J. A. Maffei, Munich.—The double compound, or articulated locomotive of the Mallet type, with four cylinders, has become a favorite on the St. Gotthard, the Central of Switzerland, and one or two other European railroads operating very steep grades. One of these engines, for the Bavarian State Railroads, was exhibited at Nürnberg. The boiler of the locomotive is mounted virtually upon two independent frames, and there are two groups of driving wheels and cylinders. The front set, consisting of two driving axles actuated by the low-pressure cylinders, is flexibly connected at one end to the smokebox, and at the other to the high-pressure cylinders' exhaust pipe. The rear set of wheels also comprises two driving axles, driven from the high-pressure cylinders, these latter taking steam through an outside saddle pipe, placed just back of the dome, and leading down on each side of the boiler to the high pressure steam chests. The arrangement of cylinders and wheels can be seen in Fig. 5. The exhaust steam from the high-pressure cylinders passes into a common cylindrical reservoir, 6 in. in diameter and 20 in. long, consisting of heavy flanged ends, between which are a number of corrugated copper folds, which give sufficient flexibility to allow the exhaust pipe to move with the forward cylinders in passing around curves. This pipe passes straight for-

ward to the saddle of the low-pressure cylinders, which in turn are provided with a similar flexible joint, between their exhaust outlet and the exhaust pipe passing into the smokebox. This construction, despite the troubles that it might cause, enables the engine to pass very sharp curves, and it also utilizes the entire weight of the locomotive for adhesion.

The dimensions are given in the following table:

High-pressure cylinders—diameter.....	16 3/4 in.
low.....	25 in.
Stroke of pistons.....	24 1/2 in.
Driving wheels, diameter.....	52 1/2 in.
Straight boiler, pressure.....	205 1/4 lbs. per sq. in.
Grate surface.....	22.3 sq. ft.
Total heating surface.....	1,317.5 sq. ft.
Rigid wheel base.....	19 ft. 8 1/2 in.
Total wheel base.....	19 ft. 4 1/2 in.
Total weight in working order (all on drivers).....	124,000 lbs.

Six-Wheels Coupled Tank Locomotive, A. G. Krauss & Co.—This locomotive, designed for light, local traffic, rests upon three coupled driving axles and has under the back end a two-wheel truck. Fig. 6 shows the design. The water supply is carried in side tanks, and coal is stored in a bunker on an extension of the main frames. The engine is outside connected, and has the Heusinger valve motion.

The following are the dimensions:

Diameter cylinders.....	14 1/2 in.
Stroke.....	20 in.
Diam. driving wheels.....	39 1/2 in.
truck.....	31 in.
Straight-top boiler, pressure.....	176 1/2 lbs. per sq. in.
Grate surface.....	14 sq. ft.
Total heating surface.....	728.7 sq. ft.
Boiler.....	11 ft. 9 in. long.
Total wheel base.....	16 ft. 7 1/2 in.
Weight on drivers.....	68,400 lbs.
Total weight in working order.....	86,100 lbs.
Water capacity.....	1,139 gals.
Coal space.....	63.5 cu. ft.

Four-Wheel Tank Locomotive, A. G. Krauss & Co.—Fig. 8 shows a light locomotive for use in iron and steel works, by contractors, and other duty of that nature.

Its dimensions are:

Diameter of cylinders.....	7 in.
Stroke.....	11 1/2 in.
Driving wheels, diameter.....	24 in.
Grate surface.....	3.3 sq. ft.
Total heating surface.....	166.3 sq. ft.
Boiler pressure.....	176 1/2 lbs.
Water space.....	209 gals.
Coal.....	11 cu. ft.
Weight in working order.....	17,860 lbs.

Fig. 9 shows the standard eight-wheel tender designed for the express locomotives shown in Fig. 1, 2 and 3. It weighs 40,350 lbs. empty, and has a capacity of 4,755 gals. of water and 229.5 cu. ft. of coal. The wheels are 39 1/2 in. diameter, and the total wheel base is 19 ft. 4 1/2 in.

Trains in and out of New York Terminal Stations.

The following summing up of the number of trains in and out of New York terminal stations is interesting. It will be observed, for example, that the Long Island has about 38 per cent. of all the week-day trains in and out, and that it has nearly 100 more than the New York Central, the New York, New Haven & Hartford, the Pennsylvania and the Lehigh Valley combined, notwithstanding the great suburban business of these latter roads. This, it will be observed, is the summer timetable.

LONG ISLAND RAILROAD.

Trains in and out of Terminal at Long Island City, Flatbush avenue, Eushwick and Bay Ridge, Summer Time-Table.

Out.	Daily, except Sunday.	In.
181.....	Long Island City.....	177
107.....	Flatbush avenue.....	104
26.....	Bay Ridge.....	26
16.....	Bushwick.....	14
330.....	Total in and out of terminals.....	321
Out.	Sunday.	In.
132.....	Long Island City.....	129
109.....	Flatbush avenue.....	105
21.....	Bay Ridge.....	21
7.....	Bushwick.....	6
266.....	Total in and out of terminals.....	261

NEW YORK CENTRAL & HUDSON RIVER AND NEW YORK, N.W. HAVEN & HARTFORD.

Trains in and out of Grand Central Station, Summer Time Table.

Out.	Daily, ex. Sun.	In.	Out. Sunday.	In.
98...	New York Central.....	91	47...	N. Y. C...48
50...	New Haven.....	50	18	N. H.....17
<hr/>			<hr/>	
148....	Total in and out.....	144	65...	Total... 65

PENNSYLVANIA RAILROAD.

Trains in and out of P. R. R. Station, Jersey City, Pennsylvania Railroad and Lehigh Valley Railroad.

Out.	Daily, except Sunday.	In.
93.....	Pennsylvania Railroad.....	92
16.....	Lehigh Valley.....	16
22.....	N. Y., Susq. & W.....	22
3.....	West Shore.....	4
131.....	Total trains.....	134
Out.	Sunday.	In.
54.....	Pennsylvania Railroad.....	53
7.....	Lehigh Valley Railroad.....	7
5.....	N. Y., Susq. & W.....	6
66.....	Total trains.....	66

CENTRAL RAILROAD OF NEW JERSEY.

Trains in and out of Jersey City.

Out.	Daily, except Sunday.	In.
147.....	Total trains.....	147
Out.	Sunday.	In.
64.....	Total trains.....	64

DELAWARE, LACKAWANNA & WESTERN.

Trains in and out of Hoboken.

Out.	Daily, except Sunday.	In.
94.....	Total trains.....	94
Out.	Sunday.	In.
6.....	Total trains.....	6

ERIE RAILROAD.

Out.	Trains in and out of Jersey City.	In.
135.....	Daily, except Sunday.	131
62.....	Total trains.....	63

WEST SHORE.

Out.	Trains in and out of Weehawken.	In.
18.....	Daily except Sunday.	19
5.....	West Shore R. R.	5
23.....	New York, Ontario & Western.....	24
10.....	Total trains.....	10

Out.	Sunday.	In.
3.....	West Shore R. R.	2
13.....	N. Y., O. & W.	12
13.....	Total trains.....	12

SUMMARY.

Week-day trains.	Out.	In.	Total.
Long Island R. R., L. I. City & Brooklyn.....	330	321	651 trains.
N. Y. C. & N. Y., N. H. & H., Grand Central.....	148	144	292 "
Penn. R. R., etc., Jersey City.....	134	134	268 "
C. R. R. of N. J., Jersey City.....	117	117	234 "
D. L. & W. R. R., Hoboken.....	91	91	182 "
Erie R. R., Jersey City.....	135	134	269 "
West Shore R. R., Weehawken.....	23	24	47 "
Sunday trains.	Out.	In.	Total.
Long Isl. R. R., L. I. City and Brooklyn.....	266	261	527 trains.
N. Y. C. and N. Y., N. H. & H., Grand Central.....	65	65	130 "
Penn. R. R., etc., Jersey City.....	66	66	132 "
C. R. R. of N. J., Jersey City.....	64	64	128 "
D. L. & W., Hoboken.....	6	6	12 "
Erie R. R., Jersey City.....	62	63	125 "
West Shore R. R., Weehawken.....	13	12	25 "

Street Railroads and Municipal Corporations.

Last week we gave a brief report of some sessions of the special committee appointed by the Governor of Massachusetts to consider the relations between street railroads and municipal corporations. The hearing was continued Wednesday, Thursday and Friday of last week, adjourning on the latter date until Tuesday, Nov. 30, when Everett W. Burdett, representing the Massachusetts Street Railway Association, will make his argument.

At the hearing on Wednesday, Mr. Bentley W. Warren, Counsel for the Lynn & Boston Railroad, stated that his road now operated 160 miles of track in 19 municipalities. In 20 years the corporation had paid out but three dividends of four per cent. each. While there had been but little friction, there was a strong need of reform after 40 years of legislation, based on a misconception of the analogy between the street railroad and the steam road. On the question of granting locations the local board should be only what the law intends, one of the contracting parties. He argued that the possibility of revocation of locations hindered the sale of bonds of a street railroad company. To make a small fare for a short distance would be a hardship, for it would only help the persons who could well afford to pay five cents to ride a block at the expense of the persons who are helped by being able to ride nine miles for five cents. He did not believe that a contract made by one town government with a street railroad could be made to bind the succeeding board. Street railroads, as a matter of justice, should have their locations protected, and he favored a permissive bill, which should apply to all new companies, fixing a term for franchise, into which the old companies should come as fast as possible. If such a law had been passed in 1891, one-half the present companies would now be under it. The West End paid into the treasury of Boston as much money as all the companies of Cleveland paid in 10 years.

Mr. C. W. Smith, Treasurer of the Newton Street Railway Co., advocated a franchise without the right of revocation of locations, on the ground that it would be easier to float bonds. Ex-Mayor Winter, of Springfield who represented the Springfield and Northampton companies, denied that the presence of street railroads in a street increased the municipal expense for repairs, except in the case of very narrow streets. Robert S. Goff, General Manager of the Globe Street Railway Co., of Fall River, said the reduction of the price of tickets to six for a quarter had not increased the number of fares.

On Thursday the public was invited to discuss the question, and Mr. George Albree, formerly General Manager of the New England Telephone & Telegraph Co., spoke at some length. He recognized the objections to a limited franchise, but thought if there was a limit it should be for 30 years, and he made several suggestions as to the line the committee should follow in its report to the legislature. His specific recommendations were that street railroad franchises should be exclusive in name as in fact; that they be for a 30-year term, with a proviso that the plant may be purchased at the end of that term under proper conditions, by the city, or that it may be purchased upon a voluntary surrender by the company, or upon its neglect to use the tracks for 30 days; that the Board of Railroad Commissioners be given absolute power to fix tariff rates and that the same commission be empowered to impose a franchise tax, this in no case to be imposed until it had paid a dividend of at least six per cent. He pointed out that the more secure the state made the property the more it could demand, and that the return could be made from four to ten per cent. if the investment was properly protected. He believed it better to bond an indebtedness for a change of motive power than to capitalize it. Under proper conditions the bonds could be sold for 4 1/2 per cent., while an annual payment of two per cent. into a sinking fund would take

care of the bonds at the end of 30 years. It was better to pay 6½ per cent. for 30 years than to pay a six per cent. dividend on the same amount in stock perpetually.

On Friday Hon. Moorfield Storey, of Brookline, advocated checks on local boards by the legislature to prevent their giving away valuable franchises too easily. He had quite a debate with the Chairman, Mr. Charles Francis Adams, the latter asserting that the speaker's views were in direct opposition to the American idea of local self-government. Mr. Storey denied this, but held that he believed that our system was one of checks and balances.

The Subway Coverings on Boston Common.

In the engraving we show the appearance of the buildings covering the Boston subway entrances at the Park street station, now completed and in use. The view is



Coverings for the Entrances to the Boston Subway.

taken looking south from Park street. There are eight of these buildings in all, four at each of the two stations on the Tremont street mall of the Common (the other station being at Boylston street). Each building covers an independent staircase, of which two at each station are used for exits and two for entrances, for north-bound and south-bound cars respectively.

These buildings are built of Deer Island granite roofed entirely with copper skylights placed high above the cornice to admit the passage of air at the eaves. They are lined with white enamel brick, the window grilles, door frame and transom being of bronze. The sashes are of wood glazed with plate glass. The stairways are of iron covered with Mason's safety tread, and at the top, between the steps and doorway, is a platform about 8½ ft. wide, containing a slatwork of iron with a pan beneath it, by which water and rubbish from the street is caught and carried off to the gutters. The stair railings are of iron surmounted by brass, and the stringers, bases and other edgings about the stairs are of light Knoxville (gray) marble. The interior corners of brickwork are all rounded. Under the stairways are closets for tools. There are at present no doors on the entrances, but double-swing storm doors, which will remain on winter and summer, are to be added. Inside, the buildings are light and airy, and the skylights and side windows are supplemented by a large sidewalk light, extending the whole width of the building at the foot of the stairway. Ample daylight is thus thrown upon the platforms, so as to avoid entirely the use of lamps in their vicinity in the daytime.

The stairway is in each case shut off from the platform, at the entrance by the fare-takers' booths and at the exits by stiles which permit passage only one way. Signboards are hung about the platforms directing passengers to their proper cars.

The buildings are built on the steel framework of the subway and are very solidly constructed, all girders being filled in solid with concrete. The architects were Messrs. Wheelwright & Haven, and the contractors Norcross Brothers.

The chief interest in these buildings is in the fact that they are the first of their kind ever built in America, and being in such a public place it was a problem, architecturally speaking, on what lines to design such small buildings to give an artistic effect. The design is based on Grecian forms, but the scale of treatment is rather delicate for granite. There has been, of course, more or less criticism among Bostonians, amateur and professional, but in spite of the objections offered, no one has been able to suggest a superior mode of treatment.

There are two other small buildings on the Common connected with the subway, these being exhaust outlets for the ventilating fans. These were constructed

by the engineering department of the Boston Transit Commission, and are also of granite, but very small and inconspicuous. The stone is rock-faced, eight-cut work, and is covered with an overhanging wooden roof. The entire Tremont street mall of the Common has been paved with granolithic cement paving. The other subway station coverings at Scollay, Adams and Haymarket squares will be of iron, comparatively plain, and built by the Commission.

An Arrangement for Increasing the Available Diameter of Turn-Tables.

The *Revue Générale des Chemins de Fer* for June gives a description of an arrangement used by the Eastern Railroad of France for increasing the available diameter of their turn-tables. In some special cases, or for economical reasons due to the infrequency with

springs, and which only drop down as the wheels come in contact with them on entering or leaving the lorry. The wheels are of cast iron. A lifting arrangement is placed in the center of the lorry, by which it can be easily raised to derail it in case of necessity.

While the engine is being turned the lorry is rigidly attached to the turn-table by two chains fastened on one side, while their free ends are slipped over hooks on the movable portion of the turn-table. When it is desired to use the lorry it is brought into line with the tracks on the turn-table, and receives one pair of wheels of the engine, the remaining pairs being on the turn-table. The fastening chains are hooked into place, and the engine is turned in the ordinary way, the turn-table drawing the lorry by one or the other of the two chains, according to the direction of rotation. When the turning is completed the engine runs off of the lorry and the latter is pushed out of the way to clear the track.

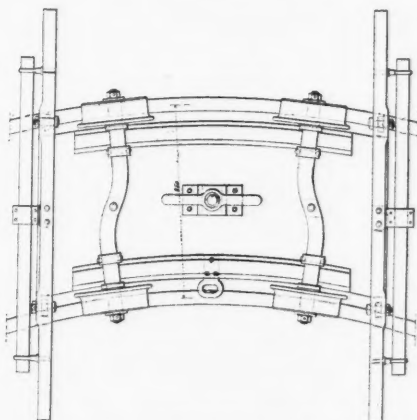
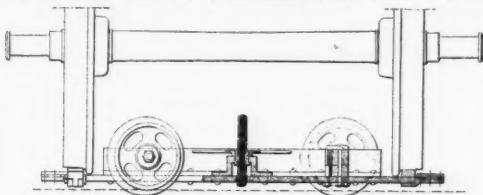
No special arrangement is necessary to keep the fastening chains tight other than that of merely regulating their length so that they can be easily slipped over the hooks on the turn table. The angular displacement which results from the slackness of the chain is of no practical importance and has never given any difficulty. An installation of this kind may often be called upon to serve two tracks at right angles to each other, and it is then sufficient to lay the circular track for one-quarter of the circumference of the turn-table only, and it is only in cases where it is necessary to turn the engine end for end, that this track must be prolonged over one-half of the circumference.

Aside from the facilities which this arrangement gives for turning engines with long wheel-base, it can also, by the change which it effects in the center of rotation, be used for turning cars or engines of great length in locations that are cramped by obstacles on one or both sides of the turn-table. The weight of the lorry is about 1,300 lbs., and it costs in the neighborhood of \$55. The expense of laying the track with old car-sills is about \$2.50 per yard. Two sets of apparatus of this kind were placed in the Eastern Railroad Company's shops at La Villette, in October, 1888, and have been used since then without ever having given the slightest trouble.

Foreign Railroad Notes.

Freight traffic on the Rhine grows in spite of the railroads. The total tonnage moved increased from 15,917,000 tons in 1886 to 21,487,000 in 1890 and 25,777,000 in 1895, when, however, it was about five per cent. less than in 1894. About one-third of this traffic in 1895 was with Holland and Belgium. The river is navigable for ocean steamers as far as Cologne; between which and London there is a regular line of freight steamers.

At the International Congress of Railroad and Marine Hygiene held in Brussels last September there was a discussion on the question whether the use of alcoholic drinks should be permitted to railroad employees and sailors. Dr. Van Coillie, of Brussels, made an address in which he answered the question negatively, 1, because such drinks are useless; and, 2, because they are dangerous to the health and lives of the men, as well as to safety in operation. He would have their use limited



Arrangement for Increasing the Available Diameter of Turn-Tables—Eastern Railroad of France.

ditions of safety, rapid and easy manipulation and low cost, and demands no modification of the normal operation of the turn-table whose available diameter it may be used to increase.

The apparatus is composed of a track concentric with the turn-table and a lorry with converging axles. The track consists merely of iron plates secured upon two rows of stringers. The lorry is made of a sheet of steel 1 in. thick, slung in stirrups from axles, and at the ends of which the rails are fastened to carry one of the pairs of wheels of the engine to be turned. These rails end in inclined wedges which are constantly kept up by plate

and so far as possible suppressed. To this end he would have the men instructed as to the dangers, and have severe rules against the misuse of liquor. Delegates from Budapest, London and Berlin doubted whether it would be possible to carry out a prohibitory regulation. The Congress agreed in a resolution recommending the managements to limit the use of alcohol by employees so far as possible; to warn the men of its dangers, punish those who get drunk and to rid the service of them. As there are scarcely any total abstainers among continental railroad men, this is a more decided step than it would seem here.



ESTABLISHED IN APRIL, 1866.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

There is probably no part of the country where there has been so much complaint of railroad rates as in California. The distances that most of its products have to be carried often prevent movement even at a very low rate. The report of the Southern California Railroad, which is the California end of the Atchison system, shows, however, that railroad owners do not always make their fortunes. This company works 491 miles of railroad, the cost of which is reported as something over \$25,000,000. In the last report the earnings, etc., are given, not only for the last two years, but for the 7½ years since Oct. 1, 1889. The net earnings in that time have been at the rate of \$228,363 a year, which is less than 1 per cent. on the whole capital account and but 1½ per cent. on the funded debt. In the last two years the net earnings were \$85,737 and \$57,007 respectively—last year at the rate of \$116 per mile, which is 5 per cent. interest on \$2,320, and we suppose that not even a California granger will claim that a mile of railroad can be built for that. He may, however, urge that what the company loses in California it makes up on the thousands of miles of the Atchison's lines east of that state. If so, as a company of Atchison stockholders and bondholders would like to have him tell them where those profits have gone.

The Southern Pacific Railroad of California (not to be confounded with the "Southern Pacific Company," which works all its lines, and those connecting them with New Orleans, and the Central Pacific's lines also) has had an experience similar to that of the railroads west of Chicago, in that an increase of mileage, with an increase in cost and fixed charges, has brought no corresponding increase of profits. In 1891 the company had 1,474 miles of railroad, with \$2,594,814 of fixed charges and \$3,851,548 of net earnings; in 1890 97, with 1,734 miles, the fixed charges were \$375,000 greater and the net earnings \$118,000 less. The addition of more than one-sixth to the mileage has brought no increase in profits. The largest net earnings were \$4,603,102, in 1893, when the length worked was 116 miles less than last year; but the average for the six years since 1891 has been but \$3,956,800, or \$105,000 more than in 1891. It is not to be assumed, however, that there has been no development of traffic meanwhile. The company's report shows that in the item of fruit alone the shipments increased from 29,740 tons in 1882 to 161,957 tons in 1890 and 290,221 last year. Unfortunately the market for this, as for most of California's productions, is at an immense distance, and the increased shipments have been secured largely by great reductions in the freight charges or great and costly improvements in the facilities for carrying it, such as fast special trains, refrigerating, etc.

The Great Northern Railway in its last report gives some statistics for the different lines which compose its vast system. It appears from this that the Eastern Minnesota, the 73½ miles which form its outlet to Lake Superior, and is to the Great Northern what the New York-Philadelphia line is to the Penn-

sylvania Railroad, earned \$25,629 per mile last year, and had a freight traffic equivalent to the movement of 1,873 tons each way daily; at the other end of the scale is the Duluth, Watertown & Pacific, whose 70 miles earned \$562 per mile. The Montana Central, 257 miles from Great Falls to Butte, the latter a great mining and smelting center, with a heavy mineral traffic, yielded \$7,550 per mile; the St. Paul, Minneapolis & Manitoba, a great system of lines in itself, earned \$3,967 per mile on its 3,780 miles. These earnings of the parts, and still less the net earnings of each, do not, however, indicate their relative value to the lessee. Many a branch which does not, on its own mileage, earn its working expenses contributes a traffic over some hundreds of miles of main line which adds materially to the net earnings credited to the latter, but which it would not have but for the branch. The Montana Central, with its junction 967 miles from the eastern terminus and 860 from the western terminus of the main line, is in position to furnish hauls on that road several times as long as the length of its own line; and the branches in the Red River Valley send nearly all their wheat 200 to 250 miles after it leaves them, over the lines to Minneapolis and Duluth.

On a prominent railroad which now has about two-thirds of its freight cars equipped with automatic couplers, the accidents to employees in coupling cars in 1896 equaled 11.1 per cent. of all the personal casualties occurring on that road during the year, as compared with 28.6 per cent. in 1891. For six years the percentages have been:

1891.	1892.	1893.	1894.	1895.	1896.
28.6	27.9	26.3	23.2	17.4	11.1

The percentages of all kinds of personal accidents, to the totals, on this road are remarkably uniform year after year, a fact which, in our opinion, affords strong presumptive evidence that preventable accidents—those not due to the incurable tendency of human beings to make blunders—must have been reduced to a very low rate. The well-known high efficiency of the management of the road makes one ready to believe this. It will be understood, of course, that these figures refer to the number of casualties of all kinds, and that they give no information as to the severity of cases; but on a large road, for a whole year, the number and variety are such that averages—usually dangerous bases for calculation—have a real value. It is to be remembered that these are not newspaper reporters' figures, like some of those concerning personal injuries in our train-accident record, but official and complete. The foregoing statistics include a few accidents to station employees; the accidents, of all kinds, to brakemen, on the road referred to, bore the following ratios to the totals:

1891.	1892.	1893.	1894.	1895.	1896.
891.	45.8	44.3	39.1	30.8	26.0

Another interesting feature of the report from which these facts are taken is the column showing what percentage of all the casualties result in death. In the six years cited the percentages of fatal accidents to all accidents were:

1891.	1892.	1893.	1894.	1895.	1896.
10.3	9.0	8.5	8.6	5.1	5.9

What proportion of this marked improvement is due to the use of automatic freight car couplers and of air-brakes on freight trains is a question which would require too extensive an investigation to be taken up at this time; but whatever it be, the record is one highly creditable to the officers of the railroad company, and we regret that they are so modest that they will not allow us to give their names.

The official report of the October meeting of the American Railway Association, which is now out, shows that the report of the train-rule committee, interpreting certain rules of the standard code, was not accepted without a good deal of discussion. A part of this discussion, filling two pages of the report, was on Rule 473, which declares that "Orders once in effect continue so until fulfilled, superseded or annulled." This rule ought to have a clause explaining that annulment can only take place by the lapse of time, as indicated in Rules 320 and 407, or by the act of the train despatcher; and that superseding is not to be deemed to have taken place unless the despatcher says so, in writing, to all concerned, as, for instance, by inserting in a subsequent order the words "instead of." By turning forward 15 pages any one can find, under "Form L," the proper methods of annulling and superseding, but it is not said that these are the only methods allowable, and so the committee is importuned to declare it allowable for conductors and engineers to decide for themselves whether or not an order has been superseded. It was not made clear whether, in actual practice, a conductor could ever make a wrong assumption on this

point, and it was shown that the use in the rule of both terms, "superseded" and "annulled," is tautological; but the committee finally secured a decisive vote against allowing conductors to assume anything. Except on the plea that despatchers must economize time down to the fine point of omitting from orders every unnecessary word, the discussion seems to be somewhat of an academic character, for a careful despatcher would so word his orders that a question of this kind would never arise. The strenuous tone of the arguments presented at the meeting indicates that although the recommendations of the American Railway Association are not binding on any one, members are actuated by a strong desire to conform their conduct to them if possible. This was particularly observable in the discussion on the rules for loading long lumber. These have been approved by the Master Car Builders' Association and are in wide general use, but postponement until next spring was asked by a single member, and the majority voted with him; the evident motive being to have the American Railway Association approve only such things as will command the approval of the largest possible majority.

The laboratory tests of brakeshoes recently made on the M. C. B. brakeshoe testing machine at Wilmerding Pa., further demonstrate the value of this apparatus when used for testing new brakeshoes. It is hardly necessary to say that railroad men will not be obliged to guess at the friction which can be reasonably expected of this particular shoe in service and because of the direct comparison which can be made with the M. C. B. brakeshoe tests it becomes known how the new brakeshoe compares for friction with other shoes in general use. We have pointed out quite recently in these columns some of the results to be derived from this apparatus, both for the railroads and for the makers of brakeshoes and brakes, if the testing machine were always available for use. It is not necessary to again present the subject in detail. The recommendation of the Chairman of the M. C. B. Standing Committee on Laboratory Tests of Brakeshoes to the Executive Committee, to establish this machine at Purdue University, has also been mentioned and it will probably receive the support which it merits.

The brakeshoe tests published quite fully in another portion of this issue, when taken in connection with the results of the road tests, furnish some useful information and bring out a number of points of general interest. For instance, it is interesting to know that the small percentage of expanded steel used in the new shoe which was tested makes the average life of the shoe about four times that of ordinary cast-iron brakeshoes, which is approximately the same service as that given by chilled iron. It is also interesting to learn that in obtaining the increased wearing qualities with the brakeshoe tested the friction has not been sacrificed, and this latter information could not have been obtained easily by any other than laboratory tests. Definite indications are not well shown in the laboratory as to the effect of a brakeshoe on the face of the test wheel, and for such information road tests are necessary where the number of applications of the brakes is sufficient to make such a change in the tire as will permit of measurement. In the present instance the road tests show that steel tires are not injured by the shoes under test. This would seem to indicate that the flowing of the steel strands on account of the heat generated under the conditions of very heavy braking from high initial speeds as noted during the laboratory tests, is not sufficient to cut steel tires. This is doubtless due to the small percentage of steel to cast iron and the peculiar manner in which the steel is distributed. In the matter of tire effect this result is different from that obtained in service with brakeshoes where wrought iron and steel are used in the form of inserts, such shoes not being considered safe to use with steel-tired wheels.

Colors for Night Fixed Signals.

The discussion of the question of colors to be used in the lamps of fixed signals for night indications, which was had in the Railway Signaling Club at its recent meeting in New York, and which was reported in the *Railroad Gazette* of Sept. 17, showed a lively appreciation of the subject on the part of the members of the Club, and probably clarified the ideas and strengthened the convictions of some of them on the questions involved. The discussion was, however, not very conclusive, except in one particular—that the Chicago & Northwestern practice was decidedly better than the general practice. But the members spoke, almost invariably, from the signalman's standpoint, and objections or difficulties which have been felt only

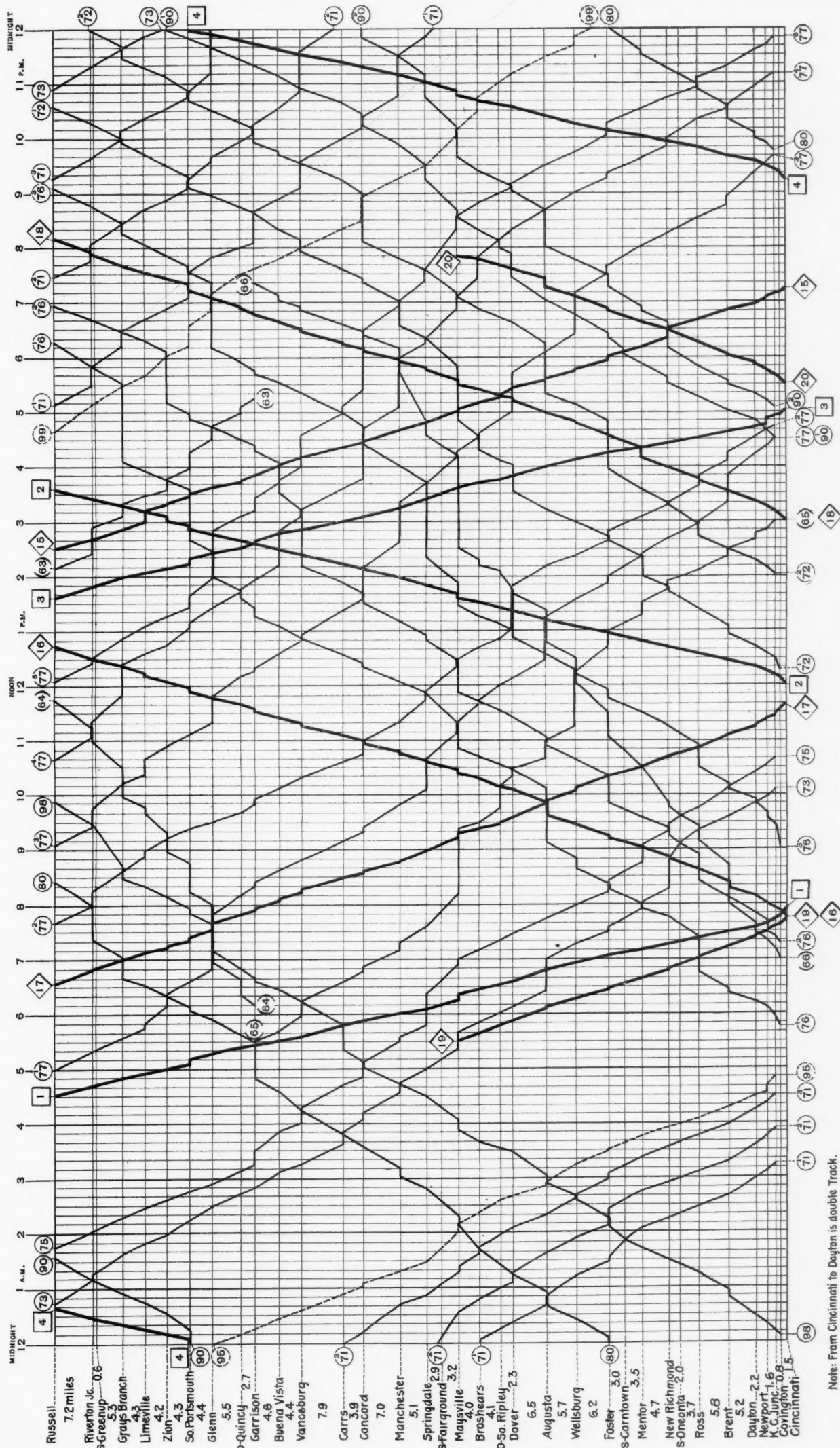


DIAGRAM SHOWING THE MOVEMENT OF ALL TRAINS RUN OVER THE CINCINNATI DIVISION OF THE CHESAPEAKE & OHIO RAILWAY ON JULY 19, 1897.

by superintendents, or enginemen were hardly touched upon, and as the point of view of the men who use the signals is fully as important as that of those who make them, it will not be out of place to make this discussion the occasion of a brief review of the subject of colors for signal lights.

The question of what and how many colors shall be used to give the various indications that are required of fixed signals at night may be considered under the heads of 1, safety; 2, convenience; 3, cost; 4, sound theory. The last ought to be first, but theories which Americans look upon as fundamental have been so long completely ignored, in practice, in England, that one hesitates to assert that principles play any part in this matter. Our English friends have achieved success, and in the presence of that all-convincing argument Theory must hide its head.

In the matter of safety, the two first questions are (a) as to the danger of the breakage of a red glass (showing a clear light), when an uncolored light is used for all-clear, and (b) as to the danger of a color-blind engineman mistaking a red light for a green one when green is used to indicate all-clear. The first danger is actual, trains having been derailed from that cause. A passenger train ran off the track close to a very busy double track crossing in Boston about a year ago, as was noted at the time in the *Railroad Gazette* (Nov. 20, 1896, page 808); and there have been a considerable number of other cases. Wire glass, or extra thick glass, or the protection of the colored glass by placing it within the lantern, behind a separate outer glass, afford some protection against this danger, but the fact remains that a radical change of scheme, using a color to indicate all-clear, and thus making the breaking of a glass change the indication in the direction of safety would be the most satisfactory solution to practically all unprejudiced operating officers and signal engineers.

The second danger, color-blindness, is more obscure, and it was not touched upon by the signal engineers in their discussion. Naturally they expect the superintendents to relieve them of this element of the problem. The possibility of mistaking red for green is just as real as the possibility that a normal-eyed person may sometime mistake dark gray for light gray, or vice-versa, for the most conclusive tests have demonstrated it to the satisfaction of "practical" uneducated persons as well as to other people; and yet it is very hard to find cases of actual collision or derailment due to the failure of an engineman to correctly distinguish between an all-right light and a stop light. But as long as color-blind men can easily be weeded out; as it is a duty to the men themselves to do so, and as no superintendent would have a color-blind in his service if he made free and intelligent choice, we do not argue the point. The possibility of danger from color-blindness should be absolutely eliminated, and the arguments for and against green all-clear lights could then be that much easier settled.

The foregoing considerations have equal weight whether distant signals are used or not; but when we come to the question of convenience we encounter the distant-signal problem. The arguments that we have stated seem conclusive in favor of using green for all-clear, but the great majority do not yet accept them. The signal engineers—those who spoke—did indeed come out in favor of green for all-clear in stop signals, but the hundreds who have not spoken still stand on record, by their practice, in favor of white for all-clear. This reluctance to make a change is due chiefly to the feeling that using green for the stop signal will leave us without any satisfactory light for a distant signal; and as a distant signal is looked upon by many as a superfluous luxury we may perhaps properly consider it under our second head, "convenience." Those members of the club who spoke in favor of green for all-clear included in their approval the whole Chicago & Northwestern scheme, in which a combination of red and green is used for the distant danger indication; but in the absence of any decided movement to adopt this scheme in practice it is fair to assume that there is a general feeling that something simpler, or more satisfactory from a theoretical standpoint, ought to be waited for. The Boston & Albany three-lamp scheme has been in use much longer than the C. & N. W., and, except in the matter of cost, may be called equally satisfactory, but it receives no more favor; less, in fact. The presentation at the club meeting of a proposition to use two white lights for the distant danger signal was another indication that the question of further simplicity is still engaging the attention of practical men.

For ourselves we deem distant signals a necessity, if enginemen are going to be required to make time in foggy and stormy weather and strict discipline is to be maintained. The desideratum, however, is not merely a distant signal but the most useful and con-

venient one. It is a convenience, that is, a satisfaction to the mind which promotes smooth working, to be able to feel that the distant signal is distinctly different from the home. A railroad man with American traditions and experience cannot feel comfortable in adopting the English custom of making the distant and home signals just alike. Hesitancy in adopting the C. & N. W. practice is due to a similar feeling born of long experience. Familiarity with lights which are actually or seemingly simpler raises a wall of objection, perhaps prejudice, against a combination light. As we should accept Mr. Vernon's proposed white light for the distant danger signal just as quickly if it were single instead of double, we accept these arguments on the element of convenience as important points in favor of the use of green for all-clear. On the other hand, it is to be admitted that it is an inconvenience—an element tending to keep one's mind unsettled on this subject—to have to feel that the use of lights in fixed signals is not entirely consistent with the use of the same colors in hand signals and on engines and cabooses.

Our third head, cost, requires little discussion. Cost of maintenance is practically the same, when once the change has been made. Even the three-light scheme of the Boston & Albany is not burdensome, according to Mr. Blodgett's testimony. To change all the semaphore castings and all the automatic signal disks and lenses in the country might cost \$100,000, or it might cost \$500,000; a close estimate is not possible, and indeed is not required, but the expense would not be great on any one road. When once all other questions are settled, it is not likely that this one will stand in the way.

Sound theory cannot be ignored, although we have left it till the last. Young and clear-minded men will be constantly rising to positions of importance and authority and they will instinctively dislike every illogical practice; so that settling a question on any temporizing basis is the same as admitting that the settlement may prove not to be permanent. Of the theories which we have spoken of as cherished by Americans but ignored by the English, the chief one is that a distant signal should always be different from a stop signal. It is to be hoped that Americans will always stick to this theory, for, notwithstanding the long and successful experience of the English seems to indicate that the facts have the better of the theory, we are just obstinate enough to maintain that sooner or later they will be vanquished; though we have only a visionary or a humorist as authority for such an opinion.

If, however, Mr. Hansel's view prevails, and American roads adopt the English distant signal lights, pending the perfection of a night form-signal, we shall then advocate the use of reddish purple for the distant, or of two red lights; so as to make some difference, if not a satisfactory one.

But on one important theory the English are right and common American practice is wrong; we mean the theory that every failure of any part of a signal should stop (or caution) approaching trains. The adoption by the English of green glasses for all-clear was due to the conviction that this theory was important, and this action of the English is the sufficient justification for continuing the agitation of the subject here.

Under the head of convenience we spoke of the use of colors on engines for indications different from those shown by the same colors in semaphores. This difference has not been much discussed, and at the signaling club was not touched upon at all. It may be said that it is a theoretical difference, not seriously affecting actual practice; but those who advocate a change in fixed signals must remember that their cause depends or seems to depend largely on the supremacy of theory, and that therefore they must be prepared to deal with opponents who also use theory for their chief defense. This matter of lamps on trains may come to be an important element in this discussion. And it is to be remembered that in this matter neither the Chicago & Northwestern's experience nor that of the Boston & Albany can be relied upon as a sure guide, as those two roads make far less use of green lights on trains than do most of the roads of the United States.

The railroad bond market has shown moderate strength for two weeks. In this respect it has differed from the course of stocks, which has been upward one day and down the next, indicating speculative rather than investment influences. Not only has the demand for bonds been fair to good, but it has been widely distributed. Transactions in the two weeks ending last Saturday aggregated in round numbers 16 million dollars. The buying was centered in the substantial interest-paying issues, although some of the so-called speculative securities came in for attention. Net gains were the rule, while losses were small in number and usually fractional in amount. The current

traffic returns are stimulating the demand, and a revival of refunding plans, of which a number are slated to appear next year, is also directing attention to good bonds. The Chicago, Rock Island & Pacific promises to issue a scheme this week or next which will scale interest to four per cent. on all or a greater part of its bonded indebtedness. The total bonds outstanding are \$61,994,000. Of these \$12,100,000 bear six per cent. interest, are due in 1917 and are a first mortgage on the main line and branches between Chicago and Council Bluffs. The Chicago & Southwestern first mortgage is for \$5,000,000, bears seven per cent. interest and matures in 1899. The first mortgage extension of \$40,394,000 and the debenture bonds of \$4,500,000 each bear five per cent. interest, and are redeemable at the option of the company at 105. In the absence of any official statement as to the refunding of these various issues there have been conflicting reports. However, all agree that all of the bonds named except the \$12,100,000 first mortgage will be refunded. This would result in a saving in interest of more than \$500,000 a year, which would be over one per cent. on the \$46,156,000 capital stock outstanding. The fact that nearly \$45,000,000 of the aggregate amount does not require the consent of holders for conversion, owing to the redemption clause, will facilitate the refunding operations. One of the features of the week was Metropolitan Street Railway 5's. There was good investment buying based upon the excellent prospects of the company. Kansas and Texas 4's and 2's, St. Louis & San Francisco issues, Texas Pacific 1's and 2's and Northern Pacific 3's and prior 4's were active. The last named lost a fraction of the previous week's gain. The anthracite coal bonds were fractionally weaker owing to adverse coal trade conditions.

Aug. 1 last a new passenger tariff was introduced on the Danish State Railroads, the chief features of which are great reductions in the rates for long distances, and for shorter distances a reduction in price of single tickets of about 30 per cent. for third-class, 25 per cent. for second class and 13 to 14 per cent. for first-class passengers. At the same time the special low rates for round-trip tickets are abolished, which leaves the cost of a journey to and fro for the shorter distances not far from the old round-trip rates, and sometimes slightly higher. Examples of third-class fares show no reductions for distances of 47 miles or less, while for greater distances the old round-trip and the new rates are:

Distance.	93 miles.	186 miles.	279 miles.
Old rate, 3d class.....	\$1.89	\$3.35	\$4.79
New rate ".....	1.62	2.39	2.84
Old rate, 2d class.....	2.97	5.29	7.60
New rate ".....	2.70	3.78	4.73

Yearly tickets, good for unlimited traveling by one passenger on all lines, have been sold heretofore at \$140.40, \$113.10 and \$70.20 for the three classes respectively; the new tariff reduces these prices to \$129.00, \$81 and \$48.60. Together with passenger fares, rates on baggage have been modified. A charge of 2.7 cents for registration on all baggage indiscriminately, as in France, is something new, as is a charge on bicycles amounting on the average to eight cents. But the charges on excess baggage have been materially reduced!

The traffic of the Manhattan Railway (New York elevated lines), after continuous and rapid increase for many years, has decreased continually since 1893, as will appear from the following statement of the numbers of passengers carried, in millions:

1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
179	188	197	215	220	196	188	183	183

The increase from 1889 to 1893 was 23 per cent.; the decrease since 1893 is 17 per cent. Last year the number was less than in 1895-96, but only a quarter of a million less, which in a traffic of this magnitude is insignificant. To observers it is evident where the elevated traffic has gone to—the cable roads have taken it. The cable cars do not run so fast as the elevated, but they can be boarded at every street corner, instead of every fifth or tenth, and moreover they take the passengers where they want to go, especially the lines that converge on Broadway below Twenty-third street. It is a case analogous to that of the electric suburban railroads which have taken traffic from the steam railroads. The electric lines are in the streets, where the people live and where they have their places of business, and their stations are at every corner. This shows the advantage of conveniently situated stations. The less the people have to travel to get to the railroad the more they use it. In large towns, therefore, very great expenditures to secure centrally situated stations may well be justified; but the truth of this is not always appreciated until it has been demonstrated by competition.

During the discussion of the report on the best metal for locomotive cylinders, at the last meeting of the Master Mechanics' Association, Mr. G. R. Henderson, Mechanical Engineer of the Norfolk & Western, showed a sample of iron used by that road for cylinder castings. The mixture consists of 20 per cent. of steel (old springs, boiler scrap, etc.), 20 per cent. No 2 coke iron, and about 60 per cent. of cast-iron scrap. It was said that good solid castings were got from this metal which finished better than the ordinary cast iron mixture, beside having the advantage of about 20 per cent. more strength. The analysis of the sample was as follows: Silicon, 1.51; manganese, 0.33; phosphorus, 0.65; sulphur, 0.68; combined carbon, 0.63; graphite, 2.45. The *Railway Engineer* (London) in commenting upon this metal expresses a fear that iron foundries would have difficulty in melting a mixture of this kind in an ordinary cupola

and, for the benefit of our contemporary and perhaps some readers in this country, we have inquired of Mr. Henderson concerning this point, and find that there is no difficulty in melting. A cupola of the ordinary Colliu type is used by the Norfolk & Western, and a small quantity of limestone is introduced as a flux, the regular charge being made up as follows:

Limestone.....	70 lbs.
Steel scrap.....	800 "
Pig iron.....	800 "
Cast scrap.....	2,400 "

The ideas of some people as to what traffic will support a railroad are very strange. A German newspaper, which takes great interest in the development of the German East African possessions, has lately said that the ruin of the ivory trade there has destroyed the value of the proposed railroad; and it goes on to show how this trade has been destroyed or diverted, and that there is no probability of any other freight. Now, when the ivory trade was probably larger than it ever has been since, the total exports from all Africa were about 875 tons a year, and the greater part of that went from the west coast. It is therefore not probable that a railroad to a German East African port could get more than one light trainload of this material in a year; and valuable as ivory is, we fear that the highest possible freight rates on this quantity would not go far toward keeping the weeds down on the roadbed, not to say paying interest on cost.

The lowest of the low rates reported recently is "coal from the Massillon coalfield to Toledo—130 miles or more—at a net rate of less than 10 cents per ton." This, says the President of the Toledo & Ohio Central Railway, Mr. Stevenson Burke, was the price accepted by one of that railroad's competitors, "before the appointment of Receivers, now in possession of the property"; a natural consequence of such rates. There is a tradition that in prehistoric days (say before 1870) live stock was carried from Erie or Buffalo to New York for a dollar a carload, so that we hesitate to say that the Ohio coal rate "breaks the record." That it was low enough for all practical purposes is indicated by the present position of the railroad that made it. Three-fourths of a mill per ton per mile does seem pretty low.

NEW PUBLICATIONS.

The *Texas Railway News and Illustrator* is the name of an illustrated monthly paper of 18 pages, of which we have received the October number. It is published at Houston at \$1 a year, and is the organ of the Texas Railway Club. The number before us starts off with a portrait of Mrs. J. E. Leith, wife of the General Freight and Passenger Agent of the Texas Midland; and, as the reader may guess from this item, the paper is devoted to both beauty and business. There is a bird's-eye view of Houston, stretching across two pages, a picture of a special ditching car made by the American Steel Foundry Co., of St. Louis, in use on the Texas Midland, and two engravings from photographs showing the scene at the driving of the last spike on the Kansas City, Pittsburgh & Gulf.

Proceedings of the Master Car and Locomotive Painters' Association. Cloth, 97 pp. New York: *Railroad Car Journal*. The bound volume of the proceedings of the twenty-eighth annual convention of the Master Car and Locomotive Painters' Association, which was held at Old Point Comfort Sept. 8, 9 and 10, has just made its appearance. Besides the body of the book, which consists of the addresses and papers read at the convention, together with the discussions, the volume contains lists of officers, of conventions and of members, the constitution and an index.

TRADE CATALOGUES.

A Manual of Information and Tables Appertaining to the Use of Structural Steel. By George H. Blakeley, C. E., M. Am. Soc. C. E. Published by the Passaic Rolling Mill Company, Paterson, N. J., and 45 Broadway, New York.

Mr. Blakeley is, as everybody interested in such matters knows, the Chief Engineer of the Passaic Rolling Mill Company, and this little pocket-book (which is prepared somewhat on the lines of the books issued by the Carnegie and the Pencoyd companies and others) is an uncommonly well designed and useful manual. In the preface we are informed that it is a new work throughout. It is intended to supply such information as might be valuable to those engaged in the design of structural steel work in general, and to the patrons of the Passaic Rolling Mill Company in particular. The tables have been mostly computed expressly for the book, and many of them are original in matter and in form. No attempt has been made to encumber the work with abridgments of mathematical tables, for such tables to be useful must be extended and complete, and only such matter is given as the author has found serviceable in his own practice.

The first 33 pages give information as to shapes made by the company and show eyebeams from 20 in. and 90 lbs. down to 4 in. and 6 lbs. per foot. Channels, tees, Z-bars and all ordinary mill shapes are also shown. Ten pages are given up to construction details, showing fire-proof floors, girder and column protection, connections for beams, girders and columns, etc.

Then we have numerous tables of the properties of Passaic shapes and of safe loads for the same and for

built-up girders. There is a chapter on the strength and deflection of beams with the usual formulae; a chapter on fireproof construction and an abstract of building laws, and tables for I-beams used in floors. There are admirable and copious tables for girders and columns made of the standard mill shapes, and finally 100 pages or more of useful information for construction engineers that has no special relation to steel shapes. The book ends with seven pages of alphabetical index. It is beautifully printed and bound by the De Vinne Press, and in originality, in compactness and system, and in judicious selection of the information wanted by an engineer of bridges and buildings it is one of the best of this class of pocket-books. Of course the modern designer, whether of roofs or of car-trucks, has discovered that he cannot get along without these useful books published by the makers of steel shapes.

Narrow-Gage Locomotives.—The Baldwin Locomotive Works (Burnham, Williams & Co.), Philadelphia, Pa., U. S. A., issue an illustrated catalogue of narrow-gage locomotives adapted especially to a gage of 3 ft. 6 in. This is a special Japanese edition and bears, beside the imprint of the Philadelphia house, that of Frazer & Co., of Japan, agents at Yokohama. The book is a good solid octavo volume of 450 pages, 22 of which are given up to a copious alphabetical index. The volume opens with the history of the Baldwin Locomotive Works brought down to 1897, which we reviewed some months ago. This is followed by the general specifications, as to material and construction and by the class designations used in the catalogue, which to be complete and comprehensive must be elaborate, for so great a variety of product. Then follow engravings of locomotives of the various types with dimensions, weights, capacity and some special comment on the peculiarities of each type or series. Naturally and properly, considerable space (50 pages) is given to a description of the Vauclain compound locomotives and to records of their performances. An important part of the book (165 pages) is a collection of 80 plates of details with code names for ordering by telegraph. In fact, especial care has been taken in this catalogue to facilitate ordering by cable.

We suppose that no other locomotive firm in the country (and few houses in other lines) have been so enterprising as the proprietors of the Baldwin Works in cultivating foreign trade, and this elaborate volume is another example of that intelligent enterprise which has given them a world-wide clientele.

The Record of the Perfect Trucks, Brill No. 27, is the subject of a circular issued by the J. G. Brill Co., of Philadelphia. Besides describing some of the important mechanical features, the circular reprints a number of letters in which are given the experience of practical electrical railroad men who have been using this truck. In some cases they have been in use on lines nearly 50 miles long where a speed of 40 miles an hour is maintained. Although there are 500 of these trucks now in service, yet no case of derailment has been reported. This is the more noteworthy because the trucks have been fitted with narrow tread wheels having shallow flanges suitable for tram rails. The steam railroad men will be interested in the fact that on the Oakland, Alameda & Piedmont Railway (now the California Railway) of Oakland, Cal., these trucks are used under standard 50-ft. steam car bodies which weigh 50,000 lbs. Those who visited Niagara Falls Convention of the American Street Railway Association had an opportunity to test the ease with which these trucks round sharp reverse curves (70 ft. radius) at 30 miles an hour.

Ties and Tie Plates.—The Railroad Supply Co., Chicago, sends a pamphlet containing a discussion by Mr. W. S. Jones, C. E., on the present and future of ties and tie renewals from actual conditions on existing roads, and an appendix on the Wolhaupter tie plate. Mr. Jones treats of the nature, the causes of, and remedy for what he calls "rail eating," which is not a manner of destroying rails, but is our old acquaintance, the wear of the tie under the rail. As he is writing to sell tie plates the remedy for this is of course obvious. Some information is given as to the life of ties and the cost of renewals, and there is a discussion of the "ideal plate." We all know which one that is. The pamphlet can be had on application to the company, which, like the great and well-known publishing houses, and like the President of the United States, gives us no street address.

The Pennsylvania Limited is described in a handsome little booklet just issued by the Passenger Department of the Pennsylvania Lines West of Pittsburgh. The pamphlet, like other publications of the kind, is made in a style in keeping with the luxurious train which it describes, but is different from the usual run, in that the direct-process engravings, showing interior views, are from photographs taken when real passengers were in the cars. The gentlemen who are smoking, the ladies who are resting and the children who are getting their money's worth in the dining car, appear more natural than in palace-car pictures, and they are vouched for as flesh-and-blood. The artist has done his part well.

The Ayars Mail Catcher Co. has issued a pamphlet showing five full-page cuts of its mail catcher, deliverer and receiver, together with a description of improve-

ments made since the first catalogue was issued. The receiver has been improved in form and made lighter. The catalogue states that the Second Assistant Postmaster-General last month issued a circular to railroads urging them to adopt one of the two devices which have proved satisfactory to the department. The Ayars apparatus was described in the *Railroad Gazette* of April 23 last. The catalogue states that the New York, New Haven & Hartford has purchased the right to use the apparatus at all stations on its lines.

Vulcanized Rubber Goods.—The Boston Belting Co., 256 Devonshire street, Boston, Mass., issues a little book which is partly catalogue and price-list, and mostly vest pocket memorandum book. We are informed that these books will be sent free of charge to anyone who asks for one, provided he is likely to be interested in this line of goods.

The Business Furniture Company, Grand Rapids, Mich., successor to the Allen Office Furniture Company, issues a catalogue showing various designs of file cabinets and office desks; also, the new style of drawers which this company now uses in connection with the office furniture which it makes.

Car Seats.—The Bushnell Mfg. Co., of Easton, Pa., has just issued its catalogue B, in connection with its street railroad department. It contains illustrations of seats upholstered in plush, rattan and leather and reversible and longitudinal seats and backs for elevated, electric and suburban cars.

Steel Mill Machinery.—The Frank-Kneeland Machine Co., 54th & Allegheny Valley Railway, Pittsburgh, issues a handsomely illustrated catalogue of machinery for rolling mills. This includes roll-turning lathes, shears of various sorts, roll trains, structural, bar and blooming mills, etc.

Brake Shoes.—The Sargent Company, Old Colony Building, Chicago, issues a very pretty pamphlet describing the Diamond "S" brake shoe, which has been described and discussed at considerable length in recent issues of the *Railroad Gazette*.

The Hilles & Jones Heavy Bar Shear.

The *Trade Journals' Review* (London) of Oct. 15 publishes the following criticism:

A well-reproduced photograph of a heavy bar shear of American make, which claims to be of recent design, has just come under our notice. It may be a new form in the United States, but we can remember having seen similar shears at work in this country at least 20 years ago. The description given by the *Railroad Gazette* is rather meager. The machine is of the guillotine form, made by the Hilles & Jones Co., of Wilmington, Del. We are willing to admit that it is generally a good machine for the purpose intended, and has all appearance of being executed in a careful and substantial manner. It is single geared, but the gear is powerful and well suited for rapid cutting. The main frame, which we assume to be cast iron, is not, in our opinion, a bit too strong for cutting 4 in. x 4 in. steel billets cold. The framing might have been easily reinforced by large steel bolts passing through the center of section at each side, and extending from top to bottom. We notice that the shear slide is counterbalanced by a small cylinder overhead for steam or compressed air. This is a common and old-fashioned error. The eccentric portion of the shaft, if made to work in a close sliding block, ought to lift as well as depress the slide; and but little power is required to raise it compared with that demanded for pressing down the upper knife. The weight of this heavy slide is here prevented from lending its aid by its gravity to the shearing pressure. In all fairness, however, we must congratulate our American cousins upon having constructed a very sensible and serviceable shearing machine for iron or steel works.

In reply to the above, the Hilles & Jones Co. has addressed the following letter to the Editor of the *Trade Journals' Review*:

"There was no particular claim for this tool as a new departure from ordinary custom; we have been building this type of machine ourselves for about 30 years, but we consider it an advance over the ordinary tool for this duty in that it is much more powerful and compact in construction and the engine is of an improved type, suitable for this class of heavy duty. You will see that the floor space required is very small for a machine of this capacity. While we occasionally use steel bolts for taking part of the strain of shearing, our general practice is to make the cast iron of sufficient section to withstand any strain likely to be put upon it. In some cases we use cast steel for main frames with good results, and do not recall at this time any breakage of a guillotine frame machine such as this when working on reasonable duty. In regard to the counterbalancing of the sliding head, we would say that the box which surrounds the eccentric is solid and would lift the sliding head positively, but we have found by experience that unless the weight of this sliding head is counterbalanced either by levers or a pressure of some kind, after the surfaces are worn, the head will drop of its own weight. This is partly due to the jar of the tool when running, and unless counterbalanced is an element of danger to the workmen. If any knives are being put in the machine without the proper counterbalance they might cut a man's hand off. The machine in question, as shown, was arranged for counterbalancing by air, but we use the same type for counterbalancing by steam or water. The steam, air or water is admitted to the underside of the piston, the upper side being free, and as the sliding head descends it simply pushes back the counterbalancing fluid into the pipes without waste of any kind except from natural condensation or leakage. This cylinder we allow for a pressure of 3½ per cent. more than the weight of the sliding head, and this in our opinion does not to any

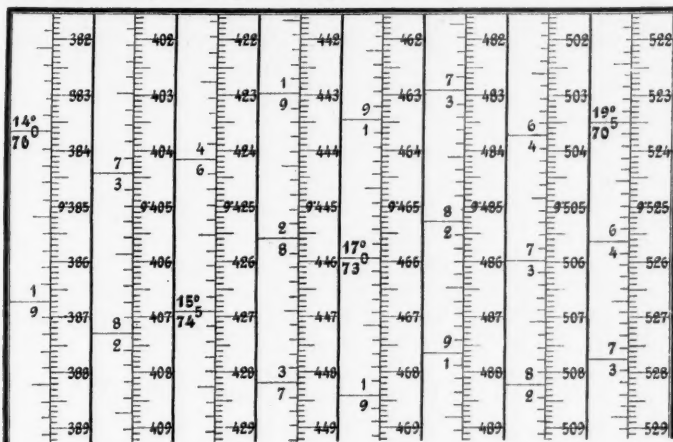
*See issue of Sept. 10, page 633.

appreciable extent reduce the capacity of the machine. For shearing 4-in. x 4-in. square billets cold, or 16 sq. in., it is customary to count about 800,000 lbs. pressure, and the sliding head weighing but 4,600 lbs. would amount to only about $\frac{1}{15}$ ths of the necessary pressure required to shear the bar. You will therefore see that on this basis of calculation it is necessary on a first-class tool to have the head counterbalanced."

Aluminum Cheaper than Brass.

Commencing with the 15th of October, the Pittsburgh Reduction Co. issued a price-list materially lowering their ordinary rates for aluminum sheet; and even in small orders aluminum sheet is as cheap as brass sheet; and where orders are of considerable size, the discounts are such as to make aluminum cheaper than brass.

Due to the difference in specific gravity or weight, in comparing the price of aluminum with brass sheet, aluminum sheet should be compared square foot for square foot with brass sheet, and not pound for pound. Thus,



Part of a Page of Graphical Logarithmic Sines and Cosines.

Reduced about 16 per cent.

aluminum sheet about $\frac{1}{3}$ of an inch thick will weigh one-half pound to the square foot, whereas a square foot of brass sheet of the same thickness would weigh about 1 lb.

Any manufacturer, therefore, in buying aluminum sheet or brass sheet will consider how many of the articles he intends to manufacture can be cut out of a square foot of sheet. If, as we have said, a square foot of $\frac{1}{2}$ -in. brass sheet will weigh 1 lb., and a square foot of aluminum sheet of the same thickness will weigh only $\frac{1}{2}$ lb., then any one would be as willing to pay in the ratio of 16 per pound for the aluminum sheet as at the rate of 5 per pound for the brass sheet, for in either case he would be paying the same amount of money and would get the same quantity of sheet, measured in square inches of the same thickness sheet.

To take a specific case with exact figures, supposing a manufacturer desired to purchase 100 square feet of $\frac{1}{2}$ -in. thick sheet:

If he should buy this in brass, the sheet would weigh 141.9 lbs., whereas if he should buy it in aluminum the sheet would weigh 44 $\frac{1}{2}$ lbs. According to the October price-list of the Pittsburgh Reduction Co., $\frac{1}{2}$ -in. sheet (No. 20 gage), in width from 2 in. to 12 in., is to be sold at the rate of 38 cents per pound for orders from 50 to 200 lbs. Inasmuch as 100 sq. ft. would weigh 44 $\frac{1}{2}$ lbs., and the price per pound is 38 cents, the cost for 100 sq. ft. of aluminum sheet would be \$16.91. If the manufacturer, however, should expend this same amount, \$16.91, in buying 141.9 lbs. of brass, he would pay for his brass 11.9 cents per pound. Thus we arrive at the result that brass at 11.9 cents per pound would be exactly equivalent to the aluminum sheet at 38 cents per pound, which latter price is the published price for No. 20 gage in the October price-list of the Pittsburgh Reduction Co.

The present list price of $\frac{1}{2}$ -in. brass sheet is 22 cents per pound, from which there is given for orders of any reasonable size a discount of 45 per cent., making a net price per pound for $\frac{1}{2}$ -in. brass sheet of 12.10 cents per pound, which is thus more than equivalent to the aluminum price.

The result of this move on the part of the Pittsburgh Reduction Co. will undoubtedly be the replacing of brass in favor of aluminum for countless uses for which brass has always been heretofore employed. Not only can the various small articles made from sheet brass be made at a cheaper price to the manufacturer himself, but also will the many objectionable features which brass possesses be replaced by the numerous meritorious features which are to be found in aluminum.

It has always been the policy of the Pittsburgh Reduction Co. to encourage any manufacturers who would purchase aluminum in very large quantities, or for uses which have heretofore not employed aluminum. When anyone goes to them with a bona fide proposition to make a totally new departure in the use of aluminum, and at the same time to consume large quantities of aluminum, the Pittsburgh Co. are ready and willing to make some special concessions to stimulate these new lines. . . . The Pittsburgh Reduction Co. has prepared for this with a very extensive rolling mill at its New Kensington Works, and are now prepared to furnish aluminum sheet wider than any other metal, with the exception of steel.—*The Aluminum World*.

Graphical Tables of Logarithms.

Herr Anton Tichy, Chief Engineer of the Imperial State Railroads of Austria, has recently published in Vienna a pamphlet under the above title, containing tables of the logarithms of numbers and of the trigonometrical functions, with an introduction describing the merits of his method and the manner of finding the logarithm of a number or a number corresponding to a given logarithm.

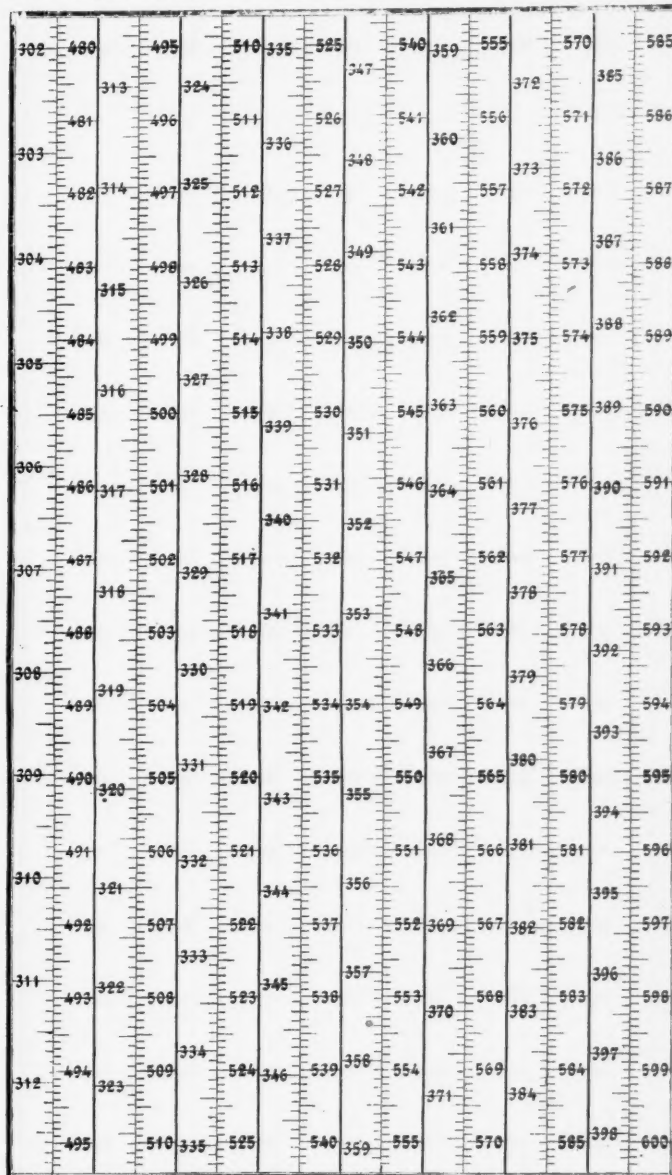
The application of a graphical method to the expression of logarithms, gives a very compact form to the columns on each page and allows the figures actually used to be printed in larger type than would be

permissible on pages of the same size in the usual manner of constructing these tables. By reference to the first illustration shown herewith it will be seen that the columns containing the numbers are divided so that between each whole number the distance is divided off into a scale of 10 equal parts, and these spaces are large enough to be again subdivided by estimation into tenths, thus adding proportionately to the range of the system without making the columns unduly broad. It will be also noticed that the logarithms are given to three figures only, but between consecutive numbers in the same column the space is divided into 10 parts, just as in the column of numbers. Again, by estimating between the divisions we can obtain the logarithm required to the fifth place of decimals.

Suppose, for example, it is desired to find the logarithm of 3.496; look in the left-hand side of one of the double columns and find 349, and under this, on the sixth decimal division, we find the corresponding loga-

in a fore-and-aft direction and carries various clutches, all but one of which engage with sprocket wheels. At the end of the spindle is a clutch which engages with an electric motor geared down by worm gearing. The wires from the motor lead to the rheostats at the steering stations in each turret and in the pilot-house. The same stations are provided with small wheels which give motion to small wire ropes led to drums in the steering-room. Each drum has its separate sprocket-chain connection to a screw spindle of the steering gear. So long as there is a supply of air, the principle of the float lever insures the motion of the tiller in obedience to that of the screw spindle.

Each steering wheel is provided with a geared index which acts as a tell tale or indicator of the rudder's motion, or rather of the motion which the rudder should have as a result of the motion imparted to the screw spindle of the float lever. It is proposed to connect the tell tale directly to the rudder post. The officer of each gun has under his feet, just above the central column, a circular index with two concentric circles, one showing the amount of rotation of the turret; the other the helm angle. The minimum air pressure that has been used in steering in smooth sea in pounds per square inch is 30,



A Page from Tichy's Graphical Logarithms of Numbers.

Reduced about 16 per cent.

Pneumatic Steering Gear of the U. S. Monitor Terror.*

The pneumatic steering gear is simple and powerful. Two athwartship cylinders, whose pistons are attached to the same heavy piston rod, are firmly secured to castings built into the ship. At mid-length the piston rod carries a slotted head, the brasses of which permit the sliding of the tiller as its angularity changes. The two cylinders are respectively to starboard and to port, and their outboard ends are utilized as motors. The common piston rod is so large that only a small area is left on the inboard face of each piston. The inboard ends of the cylinders are connected by a pipe in which there is a controlling piston valve operated by the same mechanism that admits air to and exhausts it from the outboard ends of the cylinders. The distribution of air is effected by a simple slide valve receiving its motion from a "float lever," one end of which is controlled by an arm projecting from the rudder head. The float lever receives its initial motion from a threaded spindle working in a nut on a lever. The spindle can be revolved in various ways, to be mentioned hereafter. When the distributing slide valve is in mid position, so also is the controlling valve; the latter preventing any exchange of air between the inboard ends of the cylinders. Any rotation of the threaded spindle moves both the distributing valve and the controlling valve, one valve supplying the power and the other relieving the elastic lock.

The threaded spindle which operates the float lever lies

* From a paper by Mr. H. A. Spiller presented at the fifth general meeting of the Society of Naval Architects and Marine Engineers, held in New York Nov. 11 and 12, 1897.

and the least pressure to move steering gear at dock in pounds per square inch is 5.

During the service of the Terror, since February 13, 1897, the vessel has been steered only by the pneumatic machinery, either directly, or, at times, by the electric control of the pneumatic valve of the steering engine. The pressure of 125 lbs. per square inch in the steering cylinders is maintained by one of the main air-compressing engines running four revolutions per minute, the ship being under way at sea and air is being drawn for steering only.

Changing to electric valve control is accomplished by simple means readily and quickly, leaving nothing to be desired in that respect. Steering either in the chart-house or in the forward turret has proved easy by the pneumatic wheel or by electric control.

Air leaks about the steering cylinders are quickly discovered and easily repaired. In the service of this vessel but one considerable leak has occurred there and it was remedied by renewing the packing. This is the only repair which has been made to the steering engine during a year's service. The engine does not get out of order, and does its work with certainty and efficiency. Very little lubrication is required, and the engine and steering room are always free from dirt, heat, moisture, noise and shock.

The board of officers who tested the apparatus expressed the opinion that "the pneumatic engine is well adapted to use for steering ships. It is certain, quick and accurate in operation, free from accidents and breaking down, and possesses the valuable quality of providing an elastic air lock for the tiller at every point to which it is moved."

There is considerable gain in the helm speed in the Terror, as the rudder can be started and stopped very quickly without danger, owing to the air cushion in the cylinder. The experiments showed that the helm followed the valve wheel instantly, without shock or noise.

The electric motor for moving the valve and valve ropes used from 8 to 15 amperes of current at 80 volts,

When the valve was moved slowly it required from 6 to 10 amperes.

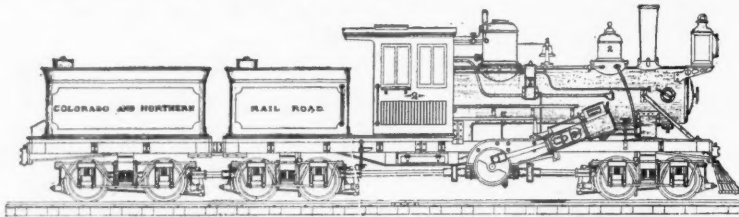
Since the steering gear has been in working condition on the Terror from April 15, 1896, not one cent has been expended for repairs, and it is in good order at the present time.

The final report of the Board of Officers of the United States Navy, dated May 29, 1897, stated: "The Board has no hesitation in commending the system by the use of the word 'excellent.'" This steering gear was built and installed on the Terror by the Pneumatic Gun Carriage and Power Co., of Washington, D. C.

A 50-ton Geared Locomotive.

The Climax Manufacturing Co., of Corry, Pa., makes a specialty of geared locomotives which are built in weights of from eight to 50 tons and for service on wood or steel rails and for roads with very heavy grades and sharp curves. The engraving shows a geared locomotive designed and built by this company for the Colorado & Northern Railroad, Boulder, Col.

The boiler is mounted in the center of a steel frame, with a horizontal engine on each side attached to the main frame and free from any working strain on the boiler. The power is transmitted to the drivers by a longitudinal shaft having universal couplings making it flexible, and on which shaft are solid steel pinions



A 50-Ton Geared Locomotive.

meshing into heavy steel gears on the axles, making each wheel a direct and positive driver.

The driving wheels are 31 in. in diameter, with steel tires $2\frac{1}{2}$ in. thick. The fuel used is bituminous coal. The weight in working order is 50 tons.

The rigid wheel base is for forward truck 44 in., rear truck 56 in., and the total length is 42 ft. The general equipment is Westinghouse air-brake, Lappin brake-shoes, Aschcroft steam gages, consolidated safety valves, Detroit triple feed lubricator with Tippet attachment metallic packing, Ohio injectors and star headlight.

TECHNICAL.

Manufacturing and Business.

The plant of the Rhode Island Locomotive Works, at Providence, R. I., will be sold at public auction Dec. 23, to satisfy a mortgage of \$300,000 held by the Rhode Island Hospital Trust Co., trustee.

The United Railway Supply Co., of Camden, N. J., has been formed to deal in general railroad supplies. The capital stock is \$50,000 and the incorporators are: Walter N. Boyer, Z. P. Boyer, Jr., John Bewry and David McKee, of Philadelphia, and John Rickenback, of Camden.

The Automatic Railway Signal Co., of Columbus, O., has been incorporated for the purpose of making and dealing in railroad signals and other railroad supplies. The incorporators are C. W. Critchfield, O. W. Aldrich, A. B. Snyder, S. M. Hall and O. C. Logsdon.

The Sterlingworth Railway Supply Co., of Easton, Pa., reports the following recent orders for Sterlingworth rolled steel brakebeams: Delaware, Lackawanna & Western, 2,500; Southern, 4,000; Swift & Co., 3,000; Cincinnati Southern, 800; Central of Georgia, 800; Norfolk & Western, 4,000; St. Louis & San Francisco, 800; Lehigh Valley, 350; George's Creek & Cumberland, 400; Ohio Central, 500; West Virginia Central & Pittsburgh, 300; Wheeling & Lake Erie, 500; Manhattan Oil Co., 500; Atlantic Coast Line, 400; New York, Ontario & Western, 400, and some smaller orders from about 25 other railroads.

The Williams & Moore Railway Jack Co., of Chicago, on Nov. 18 made an assignment to Lucien M. Williams. The assets are estimated as \$5,700 and the liabilities \$13,000.

Walter J. McBride has been elected to succeed Mr. Joseph Taylor as Secretary of the Michigan-Peninsular Car Co., Detroit, Mich.

The Cincinnati Corrugating Co., Piqua, O., states that it has enjoyed a very flattering demand during the past few months for its various specialties, such as iron roofing, siding, ceiling, metallic lath and terne plate. Its black and galvanized iron sheet departments have been especially busy of late. A leading feature of the company's output at the present time is the production of galvanized iron roofing in various styles.

The Reading Car Wheel Co., of Reading, Pa., previously referred to in this column, has been granted a charter under the laws of Pennsylvania, with a capital of \$50,000. The Directors are: Herbert H. Hewitt, President; John J. Albright and Edmund Hayes, of Buffalo, N. Y., and Chas. H. Dubock and H. W. Cram, of Reading. Mr. Hewitt and other officers of the company hold similar positions with the Union Car Works, of Depew, N. Y.

Iron and Steel.

The plant of the East Chicago Iron & Steel Co., at East Chicago, Ind., was sold at public auction Nov. 17 to P. P. Block for \$50,000. It is stated that arrangements are being made for putting the plant in operation in the near future.

It is stated that the capital of the United States Iron & Tin Plate Mfg. Co., of McKeesport, Pa., is to be increased for the purpose of building four new mills.

The works of the Springfield Iron Co., at Springfield, Ill., resumed work last week after an idleness of about one and one-half years.

It is expected that the Minneapolis Rolling Mills, at Columbia Heights, Minn., will resume work shortly.

The Sloss Iron & Steel Co., of Birmingham, Ala., has decided to issue \$1,000,000 additional stock, the proceeds to be used in developing ore deposits and building additional coke ovens.

The Shenango Valley Steel Co., of Newcastle, Pa., has awarded a contract to the Cahall Sales Department, Pittsburgh, for 6,000 H. P. of Cahall vertical water tube boilers for the new 30-mill tin-plate plant now being built at Newcastle.

New Stations and Shops.

The Great Northern is making extensive improve-

ments at West Superior, Wis., which include a new 36-stall roundhouse, a new freight-car repair shop, 360 ft. x 90 ft., and a new boiler-house and smokestack. It is also expected that a small machine shop will be erected for the repair of locomotives. New coaling chutes, new water service and depressed cinder pits are also being built.

The Pennsylvania Railroad expects to build a two-story ferry house at the foot of Market street, Philadelphia, Pa., but the plans have not yet been agreed upon.

In reference to a report published by a contemporary to the effect that the Maine Central Railroad intends to remodel its steamboat wharf at Bar Harbor, making an iron structure with new freight sheds and buildings with offices, waiting rooms, etc., General Manager Evans informs us that the road is simply looking into the repair of the wharf and also the shed as they are now.

New Dock at Port Arthur.

The Kansas City, Pittsburgh & Gulf is preparing to build a large new dry dock at Port Arthur, Tex. The proposed dock will be 34 ft. deep from coping to bottom of floor, 100 ft. wide between copings, 550 ft. long and 90 ft. wide at the entrance. It is stated that the dock will cost approximately \$250,000.

The World's Consumption of Iron.

Dr. Rentzsch has prepared for the German Iron and Steel Society the following table of the production and consumption of pig iron in 1896 per head of population in various countries. The figures are for pounds:

	Production.	Consumption.
Great Britain.....	485	255
Belgium.....	316	174
United States.....	267	260
Germany.....	267	200
France.....	133	122
Austria-Hungary.....	53	64
Russia.....	24	41

This country is shown as the largest consumer per head (and of course absolutely; as it has a larger population than any other country except Russia); but it is very closely followed by Great Britain, which consumes this raw material very largely in manufactured goods exported. Belgium and Germany are the only other large exporters of iron manufactures.

Testing a Bridge to Destruction.

The management of the Baden State Railroads, having replaced an old iron bridge 65 ft. long with a new one, re-erected the old one for the purpose of testing it to destruction. From platforms on each side of the bridge it was loaded with rails. When 363 tons had been put on the bridge was depressed 1.6 in. The loading continued, and an hour later the braces were bent forward, and shortly after the bridge broke down under a load of a little more than 440 tons. The re-erection of the bridge cost several thousand marks, so that the experiment was a somewhat costly one.

Electric Swing Bridge Motor.

The swing bridge over the Chicago River at Jackson street, Chicago, has been equipped with electric motors for moving the draw span.

Gas Engines for Electric Lighting Stations.

The *La Lumière Electrique* sums up the advantages of the gas engine for the generation of electricity as follows:

1. The facility with which gas can be obtained from existing sources.

2. The gas-works themselves may be used as a central station.

3. It has been shown that one cubic meter of gas gives—

(a) In an ordinary gas burner of 16 candle power, a maximum of 91 candle hours.

(b) In an incandescent electric lamp, a minimum of 163 candle hours.

(c) In a Wenham lamp, a maximum of 200 candle hours.

(d) In an arc lamp, a minimum of 654 candle hours.

4. If the electric lighting were carried out by the gas company, a smaller staff will be needed than in the case of an independent company with which the advantages of combining both systems of supply, thus obviating competition, should be considered; and further, the gas supplied to the engines would, under these conditions, be obtained at the cost of production, and not at the selling price.

In this connection the results of a test made last May on the Nash gas engine direct-connected with a Nash generator are worthy of note. The test in question forms the substance of the graduating thesis of Messrs. Fred Ophuls, William I. Thompson and H. Donald Tiemann, at the Stevens Institute of Technology, and was printed in full in the last issue of the *Stevens Indicator*. The engine is a vertical type with two single-acting cylinders entirely independent of each other, the cranks being 180 degs. apart, so that two explosions occur in alternate revolutions. This is a 20-H. P. engine, the general features of which are probably pretty well known. The method of conducting the test was very much the same as that followed in similar tests with the appended results.

(1) Gas per KW. per hour (full load) = 30.83 cu. ft.

(2) Calorific power of gas = 701.3 B. T. U.

(3) H. P. lost in friction of engine and dynamo = 3.83 = 13.8 per cent. of total H. P.

(4) H. P. lost in pumping air = 1.15 = 4.2 per cent. of total H. P.

(5) Pony brake H. P. = 22.71.

(6) Gas per brake H. P. per hour = 17.62 cu. ft.

(7) Gas per hour to drive engine and dynamo (no load) = 95.2 cu. ft.

(8) Efficiency of engine = 20.6 per cent.

(9) Efficiency of dynamo = 83.1 per cent.

(10) The amount of light given by electric lamps which have been in use some time is 1.60 times as much as light which the gas used to drive the engine would give if burned directly in burners.

Effect of Submerged Third Rail on Electric Conduit Roads.

In the paper presented by Col. H. N. Heft at the recent meeting of the American Street Railway Association, and reprinted in full in our issue of Oct. 29, the statement was made that the electric cars on the Nantasket Beach and the Hartford New Britain lines ran without difficulty even when water covered the ties for two inches. From the fact that a very small percentage of acid in water renders it a fairly good conductor, the line would naturally be short circuited, so that this statement would seem at first almost incredible, but cannot be doubted inasmuch as the occurrence happened frequently and the parts submerged extended over a considerable distance. An explanation is quite simple. While the water may be a conductor, yet the rails are much better and the water between the rails acts as a water rheostat. A similar occurrence has also been noted in the conduit road in Washington, D. C., where on Oct. 9 last, as the result of a heavy rainstorm, a stretch of track some 150 ft. long on the F street line became completely flooded, the water filling and overflowing the conduit. Mr. Weaver, President of the road, states that although the conduit was completely filled with water for nearly two hours, the station was not short circuited, nor were the water rheostats called into use. The normal load of the feeder for the section is 300 A., the load during the time the conduit was flooded was 600 A., and the cars were also operated on the sections where both sides were under water. The water was practically pure, and this partially accounts for the small additional load. Although its conduit has been previously flooded several times, it has not been compelled to discontinue from this cause except once, when the water nearly covered the floors of the cars and flooded the motors. At other times the line has been operated by means of a rheostat. The present instance is the only one in which the flooded section has been operated directly from the generators without reducing medium. It was estimated that the pressure of the current on the cars in the center of the flooded portion was about 250 volts.

Launch of a Fireboat.

The fireboat William L. Strong will be launched from the yard of the builders, John H. Dialogue & Son, Camden, N. J., Saturday, Nov. 27, at 3 o'clock. The Fire Commissioners of New York, accompanied by Mayor Strong and others, will be present. The Mayor has presented a set of flags. The boat was designed by Mr. H. de B. Parsons, is of steel, 110 ft. over all, 102 ft. on water line, 20 ft. beam, 9 ft. draft, contains two Scotch boilers each 10 ft. 1 in. diameter by 11 ft. long, Morrison furnaces, compound engine, 16 in. and 30 in. x 22 in. stroke; steam pressure, 135 lbs.; fire pumps, two duplex, crank and flywheel, with capacity of 6,000 gals. per minute. The displacement, with full complement on board, is 306.8 tons.

THE SCRAP HEAP.

Notes.

The Brooklyn Heights Electric Street Railroad, of Brooklyn, N. Y., has adopted a rule prohibiting smoking on the rear platforms of cars. It is said that smoking cars are to be run if needed.

The morning fast mail from New York to Chicago over the New York Central and the Lake Shore now runs through in 23 hours and 35 minutes, leaving New York at 8:45 and arriving in Chicago at 7:20 the next morning.

The Anchor Line steamer *Bluff City* was burned at Chester, Ill., on Nov. 18; loss, \$100,000. There was a quantity of powder aboard, which when it exploded shattered the boat and damaged buildings on the shore. The 40 passengers and the crew escaped in safety.

The general offices of the Mobile & Ohio were moved back from St. Louis, Mo., to Mobile, Ala., on Saturday last. The officers, clerks and their families made a company of several hundred persons. They have been in St. Louis since Sept. 1 on account of the yellow fever epidemic in Alabama. It is estimated that during the last three months St. Louis has harbored 7,000 Southern refugees.

Fred R. Ketcham, a conductor who was discharged during the strike of 1894 by the Chicago & Northwestern Railway, and who alleged that he was prevented from obtaining employment by a blacklisting agreement between the defendant and other railroads, got a verdict for \$21,666.33 damages in the Circuit Court in his suit against the road, at Chicago Nov. 18. He sued for \$25,000. The railroad gave notice of appeal.

At Austin, Tex., on Nov. 19, L. W. Fisher and Felix Wolff were sentenced to imprisonment for 50 and 45 years respectively for robbing a train of the International & Great Northern at McNeil, Tex., Oct. 12. They pleaded guilty and had expected light sentences. The Governor of California has reprieved S. D. Worden, the train wrecker of 1894, until Feb. 1. Worden was convicted of the murder of the engineer of the train which he wrecked.

Great damage was done by floods in the state of Washington last week and the week before. Many thousand feet of new embankments on the Northern Pacific were very badly washed. The Superintendent of the Everett & Monte Cristo reports that between Robe and Everett the roadbed has been washed away for a number of miles, and the press dispatch states that the road will not be operated this winter east of Granite Falls. The same report states that the Great Northern has suffered serious damage on 20 miles of road.

The express companies doing business in Missouri have complied with a recommendation recently made by the State Railroad Commissioners by filing new tariffs which show reductions of about 15 per cent. in the rates on many important commodities. Some commodities which were double rate have been changed to single rate. The Railroad Commissioners have issued a circular ordering that the rates shown in the tariffs now filed be approved; that future changes must be filed with the Board for approval and that freight carried by express companies must be billed and transported by the most direct route, except where time may be saved, without additional cost, by sending over a longer route.

Southern refugees are now returning to their homes in Alabama, Mississippi and Louisiana in large numbers, and many of the railroads have to run extra sleeping cars to carry them. A few new cases of yellow fever are still reported every day, and a dispatch from Mobile Nov. 22 said that there had not been any killing frost up to that time, but it seems to be universally agreed that the fever has about run its course. The regular train service of the Louisville & Nashville was not entirely resumed until Nov. 20. The through sleeping car from Jersey City to New Orleans over the Southern Railway resumed its regular trips on Nov. 21.

South American Notes.

By a recent law of Chile home firms bidding on supplies for the state railroads will be protected by a system deeming their tenders equal to those of foreign firms if the price does not exceed the foreign bid by more than 10 per cent., and where the raw material is also of Chilean origin the excess allowed is 15 per cent.

Important discoveries of coal are reported as having been made in the northern part of the United States of Colombia, one edge of the new field lying within 48 miles of Cartagena. The field so far explored has an extent of 215,000 acres, estimated to contain 300,000,000 tons. The character and quality of the coal are not stated.

The state of Antioquia, Colombia, has issued a pamphlet giving details of the construction and opening of a portion of the Antioquia Railroad, the new section being 7 kilos, in length, extending from Monos to Caracoli.

The alumni of the Escola Polytechnica of Rio de Janeiro have established a monthly Revista, which is now in its seventh month. The articles do credit to the institution, one in Nos. 2 and 5, on projected improvements in the port of Maranhao, having especial interest for the engineering profession.

The project for a canal from San Lorenzo on the River Paraná to Córdoba, Argentina, has been revived, a bill for this purpose having been presented to Congress, and referred by it to the Commission of Public Works. The estimated cost is stated to be about \$6,000,000 gold.

The Pacific and Argentine Great Western Railroads have established a fast train service between Buenos Ayres and Mendoza at the foot of the Andes, making the trip 36 hours instead of 43, as formerly. The fare has also been reduced from \$66 to \$60, and it announced that the freight rates on certain products, especially the fruit of the western provinces, will next year be reduced 40 per cent.

The gross earnings of the Buenos Ayres and Pacific Railroad for the year ending June 30, 1897, were \$1,992,295, being an increase of \$200,315 over those for the previous year, and the net earnings amounted to \$945,130. The Argentine Great Western reports \$1,611,400 gross earnings, an increase of \$301,380, with net earnings aggregating \$828,370. The Pacific, with 426 miles of road, ran 1,555,959 train miles, and the Great Western, with 319 miles, ran 379,078 train miles.

Railroad Mechanical Engineering at Cornell.

Dr. R. H. Thurston, Director of Sibley College, Cornell University, has been authorized to establish a full professorship of railroad machine designs and locomotive building.

Speed Trial of the New Battleship Iowa.

The U. S. battleship Iowa has made her final and acceptable trial trip. The average speed maintained for the two hours was 13.6 knots an hour, which was regarded very well, considering some disadvantages as to wind, quality of coal used and the inexperience of the firemen. On her first trial 17 knots an hour was attained.

Another Alpine Railroad.

Next year will be opened, it is hoped, the railroad up the Gornergrat, which starts at Zermatt, 5,297 ft. above the sea, climbs through rock cuttings and a spiral tunnel $2\frac{1}{2}$ miles to the Rifflalp, 7,260 ft. above the sea, and then goes sharp up to the Rifflberg, 1,733 ft. higher. Thence it follows the Gornergrat, and reaches a station just below its summit 10,202 ft. above sea level, where on one side the mountain falls perpendicularly to the Gorner Glacier. The whole length of the road will be $6\frac{1}{2}$ miles. Most of the work is done by Italians, but on the higher levels only Swiss, accustomed to live at great elevations, could work at all, and they could do only about one third as much as men at the foot of the mountain. No mountain railroad in Europe now open reaches so high an elevation; but the Pike's Peak summit station is nearly 4,000 ft. higher, and its lower station is higher than the summit of most Alpine mountain railroads, and 1,300 ft. higher than Zermatt.

European "Car Famines."

The Prussian State Railroads administration is constrained to apologize for a state of things which would fill our railroad managers with great satisfaction. It cannot possibly furnish all the cars that shippers are calling for, and to prove that it is not to blame it is shown that that long since it ordered all the cars that all the German car builders can turn out for months to come. The "car famine" is a yearly recurring trouble, caused chiefly by the beet sugar harvest, the whole of which has to be handled within a few weeks, and the movement of coal to supply winter stocks, which does not seriously begin until about the same time. September coal shipments this year from the two principal mining districts were $7\frac{1}{2}$ per cent. greater than last year and 27 per cent. greater than in 1895. The railroads had orders for 8,856 cars which they could not supply last September, but in 1895 they had 15,086 such orders.

Russian railroads, like German ones, are complaining of a car famine, but they say it is largely due this year to the absence of a great many cars which they have been compelled to loan to the Siberian Railroad. The report is that in September and October 33,557 carloads of grain were delivered at stations for shipment which the railroads were unable to forward. Yet the crop was short in Russia this year, and so short that the government is undertaking some considerable public works in order to give employment and relieve the distress in certain districts.

The Suez Canal.

The traffic and earnings of the Suez Canal have increased almost continuously and quite rapidly until this year, when, so far, they have been about 11 per cent. less than last year. The Italian military operations in Africa and those of the French in Madagascar have in previous years contributed an important traffic; the reduction of wheat exports from India also counts for something.

River Navigation in Russia.

The extent of river navigation in Russia is not generally appreciated. Where navigable streams exist they take the place of railroads much as they did in this country down to 1860, when such streams as the Savannah, the Chattahoochee, the Tombigbee, the Illinois, etc., were important transportation routes. The Austrian consul at Kiev says about 180 steamboats ply on the river Dnieper alone. The recent reduction in railroad rates has affected their business unfavorably, however, and grain shipments which formerly went down the river to Odessa almost exclusively now go by rail, largely to Baltic ports, avoiding the long voyage through the Mediterranean. The Dnieper steamboats have been built chiefly out of Russia, largely in Königsberg, Prussia, and Antwerp, but the government has recently decreed that new ones ordered must be made in Russia.

Japanese Tariff Rates.

The new Japanese tariff, which was passed by the Lower House of the Diet on March 17, has recently been translated. By the tariff, annexed to the protocol of the Anglo-Japanese treaty, signed at London, July 16, 1894, the duties on rails are five per cent. ad valorem; telegraph wire, five per cent. ad valorem. By the tariff annexed to the protocol annexed to the Japanese-German treaty, the following duties are levied: Telegraph wires, and iron and steel rails, five per cent. ad valorem; railroad carriages and their parts, 10 per cent. ad valorem; locomotives and their parts, five per cent. ad valorem. By the tariff as passed by bill of Imperial Parliament and published in the *Official Gazette*, the following duties are levied: Locomotives and their parts, 10 per cent. ad valorem; rails and accessory bolt and nut screws, chairs, dog spikes, fishplates, etc., 10 per cent. ad valorem; screws, bolts and nuts, other than mentioned elsewhere, 10 per cent. ad valorem; cars and parts thereof, 10 per cent. ad valorem.

They Have Them in France Too.

We get from Washington the following wonderful document, which illustrates the vigilance and intelligence of our consular service:

"Hon. Henry Morris, United States Consul at Ghent, has forwarded to the State Department a report on the trials made of a patented device for stopping trains automatically and for other purposes. He says:

"A little time ago the French State Railway [sic] gave a public trial of a new invention destined to effect automatically the stopping of trains, with a view to preventing collisions, grade crossing accidents, etc. The experiments took place under the direction of Mr. Raffo, the inventor, at Beaulieu le Bendray, near Chartres, before many railway engineers and a numerous gathering of scientists. Those present are said to be convinced that the apparatus fulfilled all the claims made for it.

"The point chosen for the official experiments offered the greatest possible danger and difficulties. It was on the single track line between Chartres and Orleans, at the point of divergence of the branch running to Anneau, and immediately over a grade crossing. When at a distance of 250 yards from the station the mechanism was placed in position. The invention consists of an immense hook or catch made of bent iron, to which while rigid a certain elasticity is given. It is fastened to the rails and regulated by a wire and lever from the

station. When lying flat trains passed it readily, but when raised it catches a lever hanging from the passing locomotive; the latter lever then lowers automatically, causing an air valve on the engine to open and the brakes are put into immediate action. During the trial given the train came to a standstill before reaching the station. Careful calculation has been made that this hook or catch on the railroad should have at the same time sufficient suppleness to insure its action."

The "Hon." Morris must have been trained in one of the offices of the new journalism. Nowhere else can so much ignorance be displayed in such bad English.

The Recalescence Point.

There are numerous heats at which steel hardens if chilled, but all produce a more or less weak, sandy or uncertain grain, unfit for cutting edges, except one single heat or temperature, for each carbon percentage or temper of steel. This temperature, if it can be found by the steel hardener, will produce the refined grain which gives great strength and endurance to cutting edges. The refining temperature coincides with the strange recalescence point. The point of recalescence is that temperature, varying for each carbon percentage, at which cooling steel pauses awhile, gets hotter of itself and again goes on cooling. Gore was the first to note it; Barrett confirmed it and gave it the name "recalescence." There are two breaks in the cooling. The first is of short duration; the second is a long arrest in the fall of the thermometer, its duration in 1.25 carbon steel being, according to Roberts-Austen, 76 seconds. Osmond states that the reheating of the steel is caused by the heat evolved when carbon leaves its state of solution and truly combines with the iron in steel.—*Sparks.*

Sinking of a Wharf.

Press dispatches say that on the 22d a masonry wharf, having a frontage of 300 meters on the River Tagus, in Lisbon, subsided, and completely disappeared in the river bed. An examination has disclosed the fact that the wharf, which was recently constructed at a cost of \$250,000, rested on mud. Soundings to the depth of 36 meters revealed no solid foundation. Evidently they need Mr. Greene in Lisbon.

Imports of Railroad Materials into Hawaii.

The statistics of the trade of the Hawaiian Islands for the year 1896 have recently been finished. They show that during the last year the imports of railroad materials into Hawaii amounted to 159 cars and wagons, valued at \$9,865; 6,126 rails, valued at \$9,273, and sundry railroad materials, valued at \$8,388, which were imported from countries other than the United States, on which a duty of 10 per cent. was paid. From the United States there were admitted free of duty 469 rails, valued at \$1,496, and sundry railroad materials, valued at \$7,788. There are three railroads on these islands: The Oahu Railroad & Land Co., on Oahu, about 30 miles long; the Kahului Railroad, on the Island of Maui, 13 miles, and the Hawaiian Railroads, on the Island of Hawaii, about 20 miles in length. These railroads are used principally to carry the products of the plantation to the various points of shipment.

The Walker Company.

During the last few days stories have been in the air to the effect that Eastern capitalists have obtained control of the property of the Walker Company, of Cleveland, O., by buying all of the stock and bonds of that company, but up to the time of going to press we have been unable to learn whether or not the stories are true.

LOCOMOTIVE BUILDING.

The St. Joseph & Grand Island is preparing specifications for three passenger locomotives.

The Denver & Rio Grande will probably order two new locomotives, to be built by the Baldwin Locomotive Works.

The Baldwin Locomotive Works are building four 10-wheel locomotives for the Texas & Pacific, to be delivered in the latter part of December.

The Schenectady Locomotive Works, of Schenectady, N. Y., have received an order from the Boston & Maine Railroad for two compound locomotives.

The Michigan Central is building 15 eight-wheel locomotives at the Jackson shops and expects to build five 10-wheel locomotives at the same place this coming winter.

The Baldwin Locomotive Works are to build one passenger locomotive for the Norwegian State Railways and one rack locomotive of the Abt system for La Compania Penoles, of Mexico.

The Baldwin Locomotive Works have received an order to build four mogul locomotives for the Pittsburgh, Bessemer & Lake Erie Railroad, which will be exact duplicates of the four built for the same road early this year.

The Chicago, Burlington & Quincy will build six Class H mogul freight locomotives at the Burlington shops and three at the Aurora shops, but no effort will be made at quick work, as the road now has ample motive power for its present business.

The Baldwin Locomotive Works are building one six-wheel coupled locomotive, 3 ft. gage, for the government, for use in transporting building materials on the Illinois and Mississippi canal. It will have 10 x 16 in. cylinders, 33-in. drivers, with a weight of 30,000 lbs. on the drivers. The tender capacity will be 800 to 1,000 gals. The engine will be delivered about the middle of December.

CAR BUILDING.

The Michigan-Peninsular Car Co. is building 50 freight cars for the Flint & Pere Marquette.

The Wells & French Co. is building 250 freight cars for the Atchison, Topeka & Santa Fe.

Pullman's Palace Car Co. is building one passenger car for the Kansas City, Pittsburgh & Gulf.

The Jackson & Sharp Co., of Wilmington, Del., is building one passenger car for the Dry Fork Railroad.

Haskell & Barker Car Co., of Michigan City, Ind., is building 15 freight cars for the Menasha Wooden Ware Co.

The Colorado & Northwestern recently placed an order with the Barney & Smith Car Co. for 20 freight cars.

The Cincinnati, Hamilton & Dayton is having 100 freight cars built by the Barney & Smith Car Co., of Dayton, O.

There is no truth in the report published by a contemporary that the Consolidated Steel & Wire Co. is in the market for 50 box cars.

The Michigan Central has placed an order with the Michigan-Peninsular Car Co. for 250 furniture cars, and is in the market for 750 more cars.

It is reported that the Chicago, Milwaukee & St. Paul is having built two new trains by Barney & Smith which will be delivered within six weeks.

The report published by one of our contemporaries to the effect that the Erie Railroad is about to order 400 box cars is denied by the railroad company.

H. D. Emerson, Vice-President and Superintendent of the Ohio River & Lake Erie Railroad, Alliance, O., writes us that the road will need two passenger cars and some box and coal cars.

The Denver & Rio Grande will order four new passenger cars for use on the Colorado Midland, to replace four recently destroyed by fire. They will probably be exact duplicates of the ones burned.

The Illinois Central has ordered 1,500 box cars from Haskell & Barker and 250 from the Missouri Car & Foundry Co., in addition to the 250 recently ordered from the St. Charles Car Co., and noted in these columns last week.

The Cudahy Packing Co., of South Omaha, Neb., is preparing specifications for 200 refrigerator cars which it expects to order in the near future, but we are informed by the Traffic Manager of the company that the matter has not progressed far enough to know when contracts will be let.

Nelson Morris & Co. have placed an order with the Illinois Car & Equipment Co. for 50 refrigerator cars. These will be built at the Hedgewich shops and equipped with Gould draft rigging, Simplex body and truck bolsters and Neponset roofing. The cars will be delivered in January.

The Capitol Traction Co., of Washington, D. C., has placed an order with the American Car Co. of St. Louis, Mo., for building 70 closed motor cars. They will have an extreme length of 26 ft. and a length of body 17 ft. 8 in.; width at belt rails, 7 ft. 8 in.; length of platforms, 3 ft. 5 in., and height from floor to roof, 8 ft. 1 in. Their general style will be similar to the cars of the Metropolitan Railroad of Washington, which were built by the American Car Co. The inside finish will be mahogany, embellished with neat, plain carvings, and the cars will be furnished with Adams & Westlake polished bronze trimmings and brake handles, longitudinal seats upholstered in old gold plush, two International fare registers, four electric heaters, passenger push button signals on each side post, General Electric Co. No. 1000 motors, Baltimore Car Wheel Co.'s trucks, Parmenter fenders and four sand boxes and motormen's shields designed by the American Car Co. All of the 70 cars will be furnished with imitation of leather curtains of a special design, made by the Pantasote Company, 29 Broadway, New York City, with fixtures furnished by the E. T. Burrows Co., of Portland, Me.

BRIDGE BUILDING.

Allegheny, Pa.—A new iron bridge is contemplated over the ravine between Geyer and Shady avenues, estimated to cost \$35,000.

Chicago, Ill.—Bids will be received at the United States Engineer's office, 1637 Indiana avenue, until Dec. 20 for the design, construction, etc., of the superstructures for five steel highway bridges across the Mississippi and Illinois Canal, between Bureau and Wayanet. W. L. Marshall, Maj. Engrs.

Cincinnati, O.—The County Commissioners have instructed County Engineer Krug to make an estimate on a bridge across Mill Creek, at Woodlawn.

Denver, Col.—It is said that the Board of Public Works is considering plans for a viaduct on Fourteenth street.

Easton, Pa.—The contract for a single span steel bridge to be built over Bushkill Creek, at Jacobsburg, has been given to the Groton Bridge Co., at \$540.

Eau Claire, Wis.—The contract for building the Madison avenue bridge has been given to the La Fayette Bridge Co. at its bid of \$14,190.

Fairmount, W. Va.—Wistwater & Co. have received the contract to build a bridge over the Monongahela fork, at Little Falls, to cost \$4,400.

Goshen, Ind.—It is said that the Cleveland, Cincinnati, Chicago & St. Louis will replace a number of the bridges on the Michigan Division with new iron structures. The first to be replaced will be over the Elkhart River near here.

Grand Forks, B. C.—A new iron bridge will be built across the Kettle River, a short distance below this town, by the Commissioners of Lands and Works.

Kansas City, Mo.—It is said that the contract for a steel bridge over the Belt Line at Park avenue has been given to the Gillett-Herzog Mfg. Co., at \$2,444.

Leavenworth, Kan.—It is said that the city will build a bridge over Three Mile Creek, on Sixth street, at a cost of about \$7,000.

Middletown, O.—The County Commissioners have instructed L. A. Dillon to prepare estimates for a hoist bridge over the canal at Third street.

Montpelier, Vt.—The question of building a highway bridge between here and Berlin will be decided on Nov. 29.

New York.—Bids are asked Nov. 30 for a viaduct to be built over the Harlem Railroad and its Port Morris Branch, connecting Melrose and Webster avenues Louis F. Haffen, Commissioner of Street Improvements.

Ottawa, Ont.—The construction of a bridge across the canal at Somerset street will be undertaken at an early date.

Rochester, Minn.—It is said that the contract for the bridge over the Zumbro River, at Fifth street, has been given to the J. G. Wagner Co., at \$10,800.

St. Joseph, Mo.—An ordinance has been passed by

the City Council for a viaduct over the railroads running to the stock yards. Estimated cost about \$100,000.

Syracuse, N. Y.—The new lift bridge to replace the old swing bridge across the Erie Canal at Salina street will probably be built before spring.

Union City, Pa.—The Grand Jury has approved the building of a bridge over Little French Creek and the County Commissioners have resolved to furnish the borough \$1,000 of the money necessary to build the structure.

Williamsport, Pa.—A bridge over Grofius Run is contemplated by the city. Cost about \$20,000.

Winnipeg, Man.—The City Engineer has reported that the proposed bridge over the Red River will cost \$70,000, with a reduction of \$6,000 if the old Main street superstructure be used. The report will be considered by the City Council.

Zanesville, O.—Among other improvements on the Baltimore & Ohio a four span steel bridge 600 ft. long has been built across the Muskingum River at this point, also two iron bridges on the Midland Division.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, quarterly, 1½ per cent., payable Jan. 1.

Central Massachusetts, preferred, ¾ per cent., payable Dec. 1.

Chicago, Burlington & Quincy, 1 per cent., payable Dec. 15.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The **American Society of Civil Engineers** meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The **Association of Engineers of Virginia** holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The **Boston Society of Civil Engineers** meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The **Canadian Society of Civil Engineers** meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The **Central Railway Club** meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The **Chicago Electrical Association** meets at Room 1737 Monadnock Building, Chicago, on the first and third Fridays of each month, at 8 p. m. J. R. Cravath, Secretary.

The **Civil Engineers' Club of Cleveland** meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The **Civil Engineers' Society of St. Paul** meets on the first Monday of each month, except June, July, August and September.

The **Denver Society of Civil Engineers** meets at 3 Jacobson Bock, Denver, Col., on the second Tuesday of each month except during July and August.

The **Engineers' Club of Columbus, (O.)**, meets at 12½ North High street, on the first and third Saturdays from September to June.

The **Engineers' Club of Minneapolis** meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The **Engineers' Club of Philadelphia** meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The **Engineers' Club of St. Louis** meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The **Engineers' Society of Western New York** holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The **Engineers' Society of Western Pennsylvania** meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The **Locomotive Foreman's Club** meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

The **Montana Society of Civil Engineers** meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The **New England Railroad Club** meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The **New York Railroad Club** meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The **North-West Railway Club** meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The **Northwestern Track and Bridge Association** meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The **St. Louis Railway Club** holds its regular meeting on the second Friday of each month, at 3 p. m.

The **Southern and Southwestern Railway Club** meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The **Technical Society of the Pacific Coast** meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The **Western Foundrymen's Association** meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The **Western Railway Club** meets in Chicago on the third Tuesday of each month, at 2 p. m.

The **Western Society of Engineers** meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736 1739 Monadnock Block, Chicago.

The Chicago Electrical Association.

A meeting of the Chicago Electrical Association was held Friday evening, Nov. 19, at Room 1737 Monadnock Block, Chicago. Mr. S. G. McMeen read a paper, "Daily Mathematical Conveniences."

Engineers' Society of Western Pennsylvania.

A regular meeting of the Engineers' Society of Western Pennsylvania was held in the lecture room of the Society, 410 Penn avenue, Pittsburgh, Nov. 16. The paper of the evening was a report of the Committee on Roads. The report was elaborate, and gave exact information concerning a number of types of roads with cost of labor and material. There were also illustrations given showing methods of building. After the reading of the paper there was a discussion in which many details were brought out with respect to the methods of construction. A point insisted upon was the necessity of making very full and careful preliminary surveys. A new road law drawn up by Mr. Arthur Kirk was referred to the committee for examination and criticism.

New York Railroad Club.

At the annual meeting of the New York Railroad Club Nov. 18, the paper of Mr. R. A. Parke on "The Effect of Brakebeam Hanging upon Brake Efficiency," an abstract of which appeared in our last issue, was read. There was very little discussion and a vote of thanks was tendered Mr. Parke for the valuable matter presented. Thirty new members were elected and the following officers were chosen for the ensuing year: President, Mr. A. E. Mitchell; First Vice President, Mr. H. H. Vreeland; Second Vice President, Mr. C. M. Mendenhall; Third Vice President, Mr. S. Higgins; Treasurer, Mr. C. A. Smith. Executive Committee: Messrs. W. W. Snow, W. C. Ennis and G. M. West. Finance Committee: Messrs. R. M. Dixon, D. M. Brady and C. S. Henry.

The Railway Signaling Club.

A meeting of the Railway Signaling Club was held Tuesday evening, Nov. 16, at the Great Northern Hotel, Chicago. A paper by Mr. V. Spicer, of the Union Switch & Signal Co., on Automatic Signaling, was read and discussed. The principal point brought out by the paper was that the automatic signal as now used in America is a practical and reliable device. Mr. W. H. Elliott, of the Chicago, Milwaukee & St. Paul, mentioned as a radical defect of the automatic signal the fact that there is no one present to see whether an engineer overruns a signal; for this reason it is not wholly safe to use. Mr. Elliott favored block signals under manual control. Mr. W. W. Salmon, of the Hall Signal Co., took exception to Mr. Elliott's view, and held that under manual control the blocks are usually so long as to make necessary much permissive signaling; two or three automatic signals are generally installed in the distance usually occupied by one block under manual signaling. A point brought out by the discussion was that only those roads which have had no experience with automatic signals object to their use; those roads which have had such signals in use are extending them as rapidly as they can.

Roadmasters' Association.

The Executive Committee of the Roadmasters' Association of America held a meeting at the Great Northern Hotel, Chicago, Nov. 16. At the meeting, which lasted two days, the following were present: President, A. M. Hawkins; Secretary, J. B. Dickson; members, Messrs. Richard Caffry, W. Brandt, J. A. Lahey, F. R. Coates, G. W. Merrill, W. E. Emery. Committees were appointed to report on the following subjects at the next meeting, to be held in Denver, Col.:

1. Best Method of Preventing Creeping of Rails.—H. W. Church, Lake Shore & Michigan Southern Ry., Englewood, Ill.; H. G. Helzer, Chicago, Burlington & Quincy R. R., Chicago; Samuel Greer, New York, New Haven & Hartford R. R., Westfield, Mass.; John Redington, Lehigh Valley R. R., South Bethlehem, Pa.; J. A. Barren, Norfolk & Southern R. R., Berkeley, Va.

2. Tie Plates.—Benefits and the Results Obtained from Their Use.—W. J. Prindle, Pennsylvania Lines West of Pittsburgh, Chicago; J. L. Single, Long Island R. R., Long Island City, L. I.; Henry Ware, Buffalo, Rochester & Pittsburgh Ry., Springfield, N. Y.; M. C. Hamilton, New York, New Haven & Hartford R. R., Hartford, Conn.; Edward Marshall, Atchison, Topeka & Santa Fe Ry., La Junta, Col.

3. Track Joints.—Results Obtained from Use of Various Devices.—G. L. R. French, Boston & Maine R. R., Beverly, Mass.; J. A. Dodson, Southern Ry., Washington, D. C.; P. Rockwell, Missouri, Kansas & Texas Ry., Sedalia, Mo.; W. E. Emery, Chicago & Northwestern Ry., Chicago; E. E. Stone, Boston & Albany R. R., Springfield, Mass.

4. Adviseability of Increasing Length of Rails and Advantages to be Derived from Using Meter Ends.—C. S. Churchill, Norfolk & Western Ry., Roanoke, Va.; R. Caffry, Lehigh Valley R. R., South Bethlehem, Pa.; G. W. Merrill, Chicago, Milwaukee & St. Paul Ry., Chicago.

5. At what Degree of Curvature Should Widening of Gage Begin and How Much Should Gage be Widened for Each Degree.—F. R. Coates, New York, New Haven & Hartford R. R., Stamford, Conn.; A. S. Weston, Rome, Watertown & Ogdensburg R. R., Watertown, N. Y.; R. P. Collins, New York, New Haven & Hartford R. R., Readville, Mass.; J. W. Shanks, Central Vermont R. R., St. Albans, Vt.; H. B. Dick, Zanesville & Ohio River Ry., Zanesville, O.

6. Late Improvements in Switches and Frogs.—C. Dougherty, Illinois Central R. R., Kankakee, Ill.; S. P. Adams, Atlantic Coast Line, Wilmington, N. C.; Peter Clark, Philadelphia & Reading Ry., Philadelphia, Pa.; Thomas McKeene, Lehigh Valley R. R., Wilkes Barre, Pa.; E. H. Bryant, New York, New Haven & Hartford R. R., South Boston, Mass.

Mr. H. W. Church, of the Lake Shore & Michigan Southern Ry., will also present a paper entitled "Discipline in its Practical Application to Track Forces."

The Executive Committee proposed that the name of the Association be changed to that of the Railway Maintenance of Way Association. The new name will be brought up at the next meeting for discussion and decision.

PERSONAL.

—Mr. John F. Bletcher, City Passenger Agent of the Illinois Central, at Memphis, died Nov. 13.

—Mr. James Young, Chief Shipping Clerk of the Pennsylvania, at Philadelphia, committed suicide at Moorestown, N. J., Nov. 17.

—Mr. William A. Foster, Auditor of the Huntington & Broad Top Mountain, died at his home in Philadelphia, Nov. 17, at 42 years of age.

—Mr. A. J. Wilde has been appointed Secretary of the Kansas City Transportation Bureau, at Kansas City, Mo., to succeed Mr. C. E. Perkins, resigned.

—Mr. Thomas S. Ridgeway, for many years President of the Springfield & Illinois Southeastern, now a part of the Baltimore and Ohio, died at his home at Shawnee town, Ill., Nov. 17, at 71 years of age.

—Mr. Joseph Hellen, Treasurer of the Pacific Mail Steamship Co., has been made Secretary of that company, to succeed Mr. W. H. Lane, resigned. He will continue to act temporarily as Treasurer.

—Mr. J. Herman Bosler died at his home in Carlisle,

Pa., Nov. 18, at 67 years of age. For many years he was a director in the Cumberland Valley and a heavy stockholder in the Pennsylvania. He was also interested in a number of manufacturing companies.

—Capt. William Pope Anderson died Nov. 21 at the home of his son at Cincinnati, O. For several years he was a director of the Cleveland, Cincinnati, Chicago & St. Louis, and of the Chesapeake & Ohio and was also connected with several manufacturing companies.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—John Barron has been appointed Superintendent of the Pittsburgh Division, with headquarters at Pittsburgh, Pa., to succeed M. B. Cutter, resigned. James Billingham has been made Master Mechanic of the same division, with headquarters at Glenwood, Pa.

Charleston & Western Carolina.—Following the resignation of Second Vice-President W. A. C. Ewen, of Dobbs Ferry, N. Y., Henry Crawford, of Chicago, was chosen as his successor at the meeting of the stockholders and directors held Nov. 12. Gen. Samuel Thomas was made First Vice-President. W. J. Clark has been appointed General Manager, with headquarters at Augusta, Ga.

Chesapeake & Ohio.—O. D. James has been made Auditor of Freight Receipts and G. W. Poe Auditor of Passenger Receipts, both with headquarters at Richmond, Va. These appointments have been made on account of the recent advancement of L. F. Sullivan from the position of Auditor to that of Comptroller in the accounting and treasury department, noted in these columns last week.

Chicago & Northwestern.—Warren McCord has been appointed Traveling Passenger Agent, with headquarters at Denver, Col.

Chicago, Milwaukee & St. Paul.—F. A. Butterworth, formerly Manager of the Wisconsin & Michigan Car Service Association, has been placed in charge of the Foreign Traffic Department of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago.

Fall Brook.—At the annual meeting, held Nov. 10, G. R. Brown, General Superintendent at Corning, N. Y., was made a director to fill the vacancy caused by the death of Gen. George A. Magee.

Findlay, Fort Wayne & Western.—The general offices have been removed from Fort Wayne, Ind., to Findlay, O.

Illinois Central.—Charles Hester has been appointed Soliciting Freight Agent, with headquarters at New Orleans.

Kansas City, Pittsburgh & Gulf.—W. E. Barnhardt, of Kansas City, Mo., has been appointed Special Agent of the Mail Service. W. J. Miller has been appointed Division Master Mechanic of the Southern Division, with headquarters at Shreveport, La.

Maine Central.—At the annual meeting of the directors, Nov. 19, George F. Evans, General Manager, was elected Vice-President, to succeed Payson Tucker, who retired at the previous annual meeting.

Northern Pacific.—E. J. Pearson, Superintendent of the Rocky Mountain Division, with headquarters at Missoula, Mont., has been appointed Superintendent of the Pacific Division, with headquarters at Tacoma, Wash., to succeed Joseph McCabe, resigned.

Richmond, Fredericksburg & Potomac.—At the annual meeting, held at Richmond, Va., Nov. 17, Charles Chauncey was elected a Director to fill a vacancy.

Sabine Terminal Railway & Union Depot.—The names of the officers of this company, referred to in another column, are as follows: President, Joseph O. Osgood; Vice-President, W. L. Parkinson; Secretary, J. W. Brownlee; Treasurer, L. J. Kopke. The principal office is at Sabine Pass, Tex.

Texas Midland.—Alexander S. Vest, son of Senator Vest, has been appointed Commercial Agent, with headquarters at St. Louis.

Toledo & Northwestern.—The officers of this new road, referred to in another column, are as follows: President, G. E. Murdock; Vice-President, R. Corcoran; Secretary and Treasurer, L. H. Joy; General Traffic Manager, Sam. A. Williams; Auditor, L. F. Wright; Chief Engineer, D. C. Dunlap, all of Albion, Mich.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Cheat River.—It is reported that this company has surveyors in the field making a new survey for its road, which is projected to extend from Point Marion, Pa., a point on the Baltimore & Ohio, southeast up the Cheat River, 73 miles, to Carsons, W. Va. Previous surveys have been unsatisfactory because of difficulties of building, which it is hoped to overcome by the new survey. J. J. Stoer, of Rawlinsburg, W. Va., is President.

El Paso & Northeastern.—It is reported that a contract has been let for building this road to George S. Good & Co., of Lock Haven, Pa. The road as projected is to extend from El Paso, Tex., northeast 165 miles through New Mexico to White Oaks. C. D. Simpson, Scranton, Pa., is Vice-President. (See this column for Oct. 29.)

Greenbrier.—This company has been incorporated in West Virginia with a capital stock of \$100,000 to build a line through Greenbrier County, W. Va., from a point on the Chesapeake & Ohio northeast up the Greenbrier River to the forks of that river. The incorporators are, M. E. Ingalls, of Cincinnati; Decatur Axtell, of Richmond, Va.; J. M. Gill and H. C. Sims, of Huntington, W. Va. It is understood that the road is to be used for developing coal and timber lands.

Jalapa Railroad & Power Co.—Ten miles of railroad from Jalapa, Mex., south to Coatepec have been completed by this company, recently incorporated in New Jersey. (See this column for July 16.) The company has a concession from the Mexican government to build a line in the state of Vera Cruz from Jalapa on the Inter-oceanic south about 50 miles through Xico, Teocalo and Huatusco to Cordoba, a point on the Mexican.

Mansfield Short Line.—Preliminary and location surveys have been made for this road, which is projected to run from Shelby, O., through Richland County, southwest via Mansfield to Lucas, about 20 miles. Ma-

terials have been bought and negotiations are now in progress for grading and tracklaying. The work will be light with no bridges of importance. (See this column for Oct. 29.) C. W. French, of Mansfield, O., is President.

Mexican Roads.—The Mexican Improvement Co. is actively working out the details of a new line in the state of Tabasco to open up that state and a part of Yucatan. The company is also interested in another line to be built from Culiacan, state of Sinaloa, eastward about 95 miles to interior point. W. E. von Johannsen, 220 California street, San Francisco, Cal., is President of the Mexican Improvement Co.

Middle Tennessee & Alabama.—According to report work has been begun on an extension of this road from Madison Cross Roads, Ala., south about 4 miles to Cluttsville. This company was incorporated four years ago as successor to the Decatur, Chesapeake & New Orleans to build a line from Shelbyville, Tenn., south to Decatur, Ala., 78 miles. The road has been completed from the Moore County line, Tenn., south to Madison Cross Roads, 46.3 miles. C. A. Diemer, Jr., Fayetteville, Tenn., is Chief Engineer.

Montfort Colonization.—The extension of this road 12 miles from Montfort, Que., west to Arundel has been completed, making the entire road 32 miles in length from Montfort to Arundel. F. Froidevaux, of Montreal, Que., is President.

New Roads.—The Hardwood Lumber Company, which operates an extensive lumbering and timber business in Webster County, W. Va., has a force of men grading a new railroad from its mills five miles to a new timber supply, and will also build a railroad from its plant to the West Virginia & Pittsburgh.

Northern Pacific.—Seventeen miles of grading have been completed from Twin Bridges to Whitehall Station on the new Gaylord & Ruby Valley extension of the Butte Branch from Gaylord, Mont., south about 25 miles to Twin Bridges. (See this column for Nov. 12.) Track-laying and ballasting have not yet been begun. Cook & Woldson, of Helena, Mont., have the contract.

Nova Scotia Midland.—An agreement has been signed between the officials of this company and the Dominion of Nova Scotia governments for the building of a railroad from Windsor, N. S., east through Scotch Village, Mosherville, Stanley and Kennetcook to Truro, about 50 miles. There will be two bridges of importance over the St. Croix and the Shubenacadie Rivers. The road is to receive a government subsidy of \$3,200 per mile. Among those interested are William Strachen, John Beattie, P. Lyle, D. L. Lockerby, W. Mackay, S. H. Holmes and B. F. Pearson.

Sabine Terminal Railway & Union Depot.—This company was incorporated in Texas some months ago (see this column for July 9 under "Sabine Terminal") to build a terminal railroad at Sabine Pass, Tex., to connect deep-water frontage, wharves and slips and all railroads seeking terminals at that city. Actual building has not yet been begun, except on a portion of the wharf tracks, about one mile of which have been laid, but it is expected that work will be begun on the main line before long. The proposed road is from the wharves at deep water on the Gulf of Mexico north along the west bank of the connecting link to Sabine Lake, thence along the shore of the lake to a connection with the Kansas City, Pittsburgh & Gulf, at Port Arthur, in all about nine miles. The work is very light and will probably be done by the Sabine Land & Improvement Co., which is the parent company. The grades will be practically level and curvature very light. No iron or steel bridges will be necessary. Most of the right of way is now secured. The names of officers appear in another column.

Southern Pacific.—This company proposes soon to undertake an extension of its St. Martinsville Branch in Louisiana from St. Martinsville northwest about 24 miles through St. Martins Parish along the Bayou Teche to Arnaudville, St. Landry Parish, La. Surveys have been made, and bids for building the line are about to be asked for. The construction work will be extremely light, and the only bridging required will be about 600 ft. of trestling.

Susquehanna & Western.—This company was incorporated in Pennsylvania Nov. 18 with a capital stock of \$90,000 to build a line in Cumberland County from Wornleysburg across the Susquehanna River from Harrisburg south west nine miles to Mechanicsburg. The Board of Directors is as follows: Joseph L. Kaufman, J. J. Baughman, New Cumberland; F. H. Alleman, Steelton; George W. Cumler, Highspire; S. M. Hertzler, Eberley's Mills; W. L. Gorgas, W. K. Meyers and Charles D. Stucker, of Harrisburg.

Tacoma & Columbia River.—This company is said to be negotiating for ties, rails and other material for an extension 1½ miles southward from Lake Park. The company expects soon also to begin its further extension to the Columbia River, referred to in this column Nov. 12. William Bailey, 50 Broadway, New York, is President.

Tennessee & Cumberland River.—The Tennessee Northern, which was the old name of this company, has changed to the present name because another company had previously been chartered in Tennessee by the same name. The road as projected is to run from Bear Spring, Tenn., south 14 miles to Tennessee Ridge on the Memphis Branch of the Louisville & Nashville. The grading is completed and nearly ready for track laying, which it is expected will be completed some time next month. There are no iron or steel bridges, all being of wood. The maximum grade is two per cent, and the two important curves are one 12 degs, and the other 10. J. H. Lory, Bear Spring, Tenn., is President, and Charles Seymour, Madisonville, Ky., is Chief Engineer.

Toledo & Northwestern.—More than half the grading has been done on this line, which is to run from Albion north 24 miles through Duck Lake and Duttonville to Charlotte, a point on the Chicago & Grand Trunk. The maximum grade is 1.3 per cent, and maximum curves 3 degs. All contracts for building are let to the Chicago & Cleveland Construction Co., 805 Tacoma Building, Chicago. It is expected that the road will be in operation by Jan. 1 should the weather be favorable. The names of officers are given in another column.

Washington County.—It is reported that the Maine Railroad Commissioners have approved of the route of this road, and that building has been resumed. The contractors are James Crowley, Kansas City, Mo., and P. A. Smith, of Baltimore, Md. The road as projected is to extend along the Atlantic Coast through Washington County, Me., from Bangor to Calais.

Wellington & Powellsville.—Work is being rapidly pushed forward on the extension of this road from

Ahoskey, N. C., south through Bertie County to Windsor, a point on the Atlantic Coast line. Two-thirds of the road has been graded and rails are now being laid. This portion the company expects to complete within the next three or four months. There is no difficult work with the exception of two long trestles across deep swamps, and the road is being built principally for timber, but will be operated for general business. J. W. Branning, Edenton, N. C., is President.

West Virginia & Northern.—This company, represented by George C. Sturgiss, of Morgantown, W. Va., its President, last week bought under a foreclosure, in the Circuit Court of Monongalia County, W. Va., the right of way and improvements, including plats and surveys of the Black Battle Railroad, extending from the Preston County line west to Morgantown. The Black Battle is a company formed years ago to build a line from Fairmont west via Morgantown to Kingwood, but aside from making surveys and doing some grading, nothing came of it. The West Virginia & Northern is the successor of the Tunnelton, Kingwood & Fairchance. It was organized about two years ago, and now operates a road from Tunnelton on the Baltimore & Ohio, north 10.5 miles to Kingwood. When the new company was organized it was announced that the road would be continued to Morgantown. Mr. Sturgiss says this will be done in the spring, and that the Black Battle surveys will be followed.

Wheeling & Lake Erie.—Rapid progress is being made on the extension south along the Ohio River from Terminal Junction just north of Martins Ferry to Bridgeport. It is stated that plans are being made for a further extension of seven miles to Bellaire, O. The extension is being built on piles almost the whole distance, and the track is now completed about half way to Bridgeport.

Electric Railroad Construction.

Bethesda Park, Md.—The Washington & Rockville Railway Co. has been incorporated to build a road from Bethesda Park to the northern boundary of the District of Columbia. The incorporators include J. H. Miller, H. M. Talbot and O. T. Crosby.

Brant Rock, Mass.—The Brant Rock & Duxbury Beach Electric Railroad Co. has been organized with a capital stock of \$50,000 and has elected, among others, Walter Patterson and Henry C. Phillips, of Brant Rock, as directors.

Chatham, Ont.—A change has been made in the directorate of the Chatham City & Suburban Electric Railway Co., Mr. Angus Sinclair succeeding George C. Rankin. The company will extend its road north and south.

Goshen, Ind.—The Michigan, Indiana & St. Louis Railway Co. has completed its organization and will now endeavor to secure right of way between Danville, Ill., and Goshen, Ind.

Hartford, Conn.—The incorporators of the proposed electric road between Torrington and Hartford recently held a meeting at which it was stated that money had been secured for a survey. The cost of construction was estimated at a very low figure, about \$4,000 a mile. The right of way has been given for part of the distance, and it is not believed that it will be hindered in securing the remaining part.

Lexington, Mass.—The Lexington Street Railway Co. has advertised hearings for a location of the line between Arlington and Waltham through Lexington and Woburn, a distance in all of 18 miles.

Lima, O.—The Lima & Columbus Electric Railway Co. has been incorporated with a capital stock of \$50,000 to build an electric road from Lima, O., through Allen, Hardin, Logan, Union, Delaware, Madison and Franklin counties. The incorporators include John M. Boone, D. H. Sullivan and J. T. Lamson.

Meadville, Pa.—Construction work has been begun on Water street for the purpose of building a line previously referred to among our notes.

Morristown, N. J.—The Speedwell Lake Railroad Co. has been incorporated with a capital stock of \$50,000, for the purpose of building an electric road from a point near Watnong station, to Speedwell avenue in Morristown. The incorporators are: Frederick H. DeCoster, R. B. Moriarty, Mahlon Pitney, F. V. Pitney and F. S. Smith, of Morristown; B. K. Stickle and G. W. Stickle, of Rockaway, N. J.

Myersville, Md.—A survey has been made for an electric road from Middletown to Myersville, a distance of about 5½ miles.

Newburyport, Mass.—The People's Street Railway Co. may extend its line to Groveland at a cost of \$20,000.

New York.—The application of the Metropolitan Street Railway Co. for approval of a change of motive power to electricity, to be worked by the electric conduit method on Eighty-sixth, One Hundred and Sixth and One Hundred and Twenty-fifth streets, has been reported on favorably by the Board of Railroad Commissioners.

Parkersburg, W. Va.—On Friday last, at Charleston, W. Va., the Secretary of State issued a certificate of incorporation to the Parkersburg City & Suburban Electric Railway Co., referred to in this column last week as the Parkersburg Electric & Railway Co. The company is permitted to use electricity, compressed air or steam, as well as to furnish light, heat and power commercially. The company is organized to accept the franchise granted by the Parkersburg City Council. Preliminary plans for building and equipping the road are already under way and a committee from the incorporators are now making a tour of other cities to discover desirable methods and equipment: \$300,000 of the capital stock is said to have been paid in.

Pittsburgh, Pa.—The West End Traction Co., of Pittsburgh, was granted a charter on Nov. 15 with a capital stock of \$15,000. The directors include J. C. Reilly, President; W. J. Burns and W. V. Callery, of Pittsburgh.

Plymouth, Mass.—A press dispatch states that Messrs. William H. Brine, Horace B. Taylor and William B. Arnold will petition the Legislature for incorporation to build and operate an electric road from Plymouth through Bourne and Sandwich.

Royersford, Pa.—It is proposed to organize the Royersford & Trape Electric Railroad Company, with a capital stock of \$75,000, to build from Royersford to connect with the Schuylkill Valley Traction Co., at Collegeville.

Sidney, N. Y.—The Delaware Terminal Railroad Co.

has been incorporated with a capital stock of \$150,000 to build a road from Sidney to Franklin, a distance of about 14½ miles. The directors are: Charles L. Burgess, President; David S. Myer, Treasurer; Charles N. Fuller, Secretary and General Manager. Newark, N. J.; Robert Cartwright, Sidney, N. Y.; L. F. Raymond, Franklin, N. Y.; E. R. Halsey, Newark, N. J., and others.

South Bethlehem, Pa.—The electric road between Hellertown and South Bethlehem has been completed and the first car was run on Nov. 13.

Youngstown, N. Y.—The Mahoning Valley South-eastern Railway Co., of Youngstown, has been incorporated, with a capital stock of \$50,000 to build an electric road from Youngstown to the village of Struthers in Mahoning County. Arthur A. Anderson, John E. McVey, Louis W. King, Henry M. Robinson and Charles G. McVey are the incorporators.

GENERAL RAILROAD NEWS

Albany, Belt & Terminal.—George T. Jarvis, Receiver, was granted permission in the U. S. Circuit Court Nov. 15 to pay off all the outstanding receiver's certificates amounting to about \$4,000 with accrued interest. These certificates were issued two years ago by the former receiver under permission of the court. The property of this company was purchased Feb. 15 by the Louisville, Evansville & St. Louis and is now being used by that company.

Baltimore & Ohio.—The earnings for September and for the three months ended Sept. 30 were reported as follows:

	1897.	1896.	Inc.
September:			
Gross earn.	\$2,453,750	\$2,292,931	\$160,819
Oper. expen.	1,738,765	1,629,399	109,366
Net earn.	\$694,985	\$663,532	\$31,453
Three months:			
Gross earn.	\$6,988,036	\$6,779,585	\$208,451
Oper. expen.	5,084,149	4,937,099	147,050
Net earn.	\$1,903,887	\$1,842,485	\$61,402

Centralia & Chester.—Receiver C. N. Forman made application before the Federal Court, at Springfield, Ill., Nov. 13, for permission to issue receivers' certificates not to exceed \$100,000 for needed equipment for the road. This line extends from Evansville, Ill., to Centralia, 61.5 miles, with a small branch of five miles from Sparta.

Central Pacific.—The earnings for September and for the nine months ended Sept. 30 were reported as follows:

	1897.	1896.	Inc.
September:			
Gross earn.	\$1,453,385	\$1,191,011	\$262,374
Oper. expen.	722,432	661,677	60,755
Net earn.	\$730,953	\$529,334	\$201,619
Nine months:			
Gross earn.	\$10,108,667	\$9,118,534	\$990,133
Oper. expen.	5,911,227	5,729,915	181,312
Net earn.	\$4,197,440	\$3,388,619	\$808,821

Central Vermont.—Notice is given that on and after Dec. 1 bonds will not be received under the agreement of the Bondholders' Committee, except upon the payment of a penalty of five per cent. (See this column for Sept. 17.)

Chicago & Great Western.—The earnings for October, and for the four months ended Oct. 31 were reported as follows:

	1897.	1896.	Inc.
October:			
Gross earn.	\$528,602	\$471,574	\$57,028
Oper. expen.	349,269	322,768	26,501
Net earn.	\$179,333	\$148,806	\$30,527
Four months:			
Gross earn.	\$1,923,946	\$1,638,676	\$285,270
Oper. expen.	1,261,972	1,177,978	83,994
Net earn.	\$661,974	\$460,698	\$201,276

Chicago, Rock Island & Pacific.—It is reported that plans are about to be perfected for the refunding of the bonds and other indebtedness of this road. The plan provides for an issue of four per cent. bonds to replace \$12,100,000 of six per cent. first mortgage bonds due July 1, 1917, \$5,000,000 of first mortgage Chicago & South-western seven maturing Nov. 1, 1899, \$4,394,000 of first mortgage extension and collateral five per cent. bonds due July, 1907, and \$4,500,000 of debenture five per cent. bonds due Sept. 1, 1921. Of these the last two, aggregating \$45,894,000, are redeemable on notice any coupon day at 105. It is stated that the six per cents. will be purchased by a banking syndicate at a premium calculated upon a four per cent. basis. It is estimated that by the refunding plan the company will save about \$540,000 a year.

Cleveland, Cincinnati, Chicago & St. Louis.—Holders of consolidation six per cent. bonds are notified that seven of these bonds have been drawn for payment Nov. 1, 1898, at 105 with accrued interest.

Detroit & Lima Northern.—This company has purchased the division of the Lake Shore & Michigan Southern from Dundee, Mich., northeast 27 miles to Trenton and will use it as a portion of its proposed extension from Dundee to Detroit, which is only 10 miles from Trenton.

Erie.—The earnings for the three months ended Sept. 30 were reported as follows:

	1897.	1896.	Inc. or Dec.
Three months:			
Gross earn.	\$8,545,746	\$7,485,296	\$1,060,450
Oper. expen.	5,790,665	4,869,579	921,086
Net earn.	\$2,755,081	\$2,615,717	\$139,364
Other income.	37,514	12,049	25,465
Total income.	\$2,792,595	\$2,627,766	\$164,829
Fixed charges.	2,111,864	2,155,734	43,870
Surplus.	\$680,731	\$472,032	\$208,699

Galveston, La Porte & Henderson.—It is stated that this company has accepted the offer of President Huntington, of the Southern Pacific, made some months ago to purchase the road for \$1,000,000 four per cent. bonds, and hearing will be given before Judge Bryant on Feb. 21, 1898. On Nov. 12 application for the sale of the road was filed in the U. S. Circuit Court by Contractor L. J. Smith, this move being for the purpose, it is understood, of clearing the title. In addition to \$244,987 of receivers' certificates there is about \$150,000 of receivers' debts outstanding. The road extends from Houston, Tex., to Galveston, 56 miles, with a branch from Dickenson Junction to North Galveston, four miles, and another from La Porte, Tex., to East La Porte, two miles. The road went into the hands of receivers Jan. 7, 1895.

Grand Trunk.—The earnings for September and for

the three months ended Sept. 30 were reported as follows:

	1897.	1896.	Inc. or Dec.
September:			
Gross earn.	\$1,963,593	\$1,538,756	\$424,837
Oper. expen.	1,174,019	1,165,098	8,921
Net earn.	\$794,574	\$373,658	\$420,916
Three months:			
Gross earn.	\$5,329,069	\$5,169,921	\$159,148
Oper. expen.	3,384,550	3,466,864	82,314
Net earn.	\$1,954,519	\$1,692,157	\$262,362

Houston & Texas Central.—Holders of first mortgage six per cent. bonds are notified that 230 of these bonds have been drawn for payment at 110 and accrued interest at the office of the company in New York, Dec. 31, interest to cease after that date.

Illinois Central.—Holders of the first mortgage and terminal 20 year gold bonds of the St. Louis, Alton & Terre Haute, dated Nov. 3, 1894 (\$2,500,000 outstanding) are notified that these have been called for redemption at 105 with accrued interest on June 1, 1898, at 214 Broadway, New York.

Lake Superior & Ishpeming.—Proceedings have been begun in the court at Marquette, Mich., by the State Attorney-General to have the charter of this road declared forfeited on the ground that having been operated solely as an ore road and having carried no passengers, those whose property was taken for right of way have received no benefits.

Memphis & Charleston.—Judge Lurton in the U. S. Court of Appeals, at Memphis, Tenn., has decided that this road must be sold at an early date to satisfy the claims of the creditors. The case was brought before him by the Farmers' Loan and Trust Co., of New York, on appeal by the Central Trust Co., as trustee of the general mortgage. A prior decree of Judge Lurton had been made ordering the road to be sold and the Central Trust Co. opposed the suit. This final decision is considered a victory for the minority stockholders whose rights are made prior to other claims.

Northern Pacific.—Holders of first mortgage six per cent. bonds are notified that \$399,000 of these bonds have been drawn to be paid at 110 with the coupon of Jan. 1, 1898, upon presentation at the office of the Central Trust Co., New York, interest to cease after that date.

Oregon Short Line.—Holders of consolidated first mortgage five per cent. bonds of the Utah & Northern are notified that the sum of \$58,040 has been set aside for the purchase of a portion of these bonds.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The earnings for October and for the ten months ended Oct. 31 were reported as follows:

	1897.	1896.	Inc. or Dec.
October:			
Gross earn.	\$1,429,081	\$1,234,414	\$194,667
Oper. expen.	1,011,637	968,795	42,842
Net earn.	\$417,444	\$265,619	\$151,795
Fixed charges.	327,426	242,227	85,199
Surplus.	\$90,018	\$23,392	\$66,626
Ten months:			
Gross earn.	\$12,196,415	\$12,110,064	\$86,351
Oper. expen.	8,413,766	8,229,448	184,318
Net earn.	\$3,782,649	\$3,880,615	97,966
Fixed charges.	2,623,485	2,645,638	22,153
Surplus.	\$1,159,164	\$1,234,977	\$75,813

Union Pacific, Denver & Gulf.—The Reorganization Committee announces that \$15,200,000 of first mortgage bonds have been deposited out of a total of \$15,801,000 and \$27,894,000 of capital stock out of a total of \$29,727,682. (For the plan of reorganization see this column for Sept. 24.)

Electric Railroad News.

Columbus, O.—The bondholders of the Columbus Central Railroad, in session at Cleveland on Nov. 17, voted to reject the proposition submitted by the Columbus Street Railway Co. for consolidation.

Lock Haven, Pa.—Mr. William B. Given, Receiver of the Lock Haven Traction Co., has asked permission to issue certificates for the purpose of raising funds to improve the equipment of the line and to make some changes in repairs. He reports that the earnings of the road have been sufficient to pay all operating expenses from the time the road passed into the hands of the Receiver, besides leaving a daily surplus of \$8.

New York.—The income from the Metropolitan Street Railroad Co. and the lines which it controls has been received by the city. The sum of \$150,000 from the Metropolitan Street Railroad Co., for the franchise of the Broadway line, together with the amounts received from the other lines which it controls, make the total sum \$208,461.

On Monday of this week the Amsterdam Avenue Protective Association and the Association of Public Ownership of Franchises appeared before the Railroad Committee and protested against the laying of four tracks in Amsterdam avenue. The Railroad Committee decided to have a public hearing on Wednesday of next week, to which railroad companies, the Commissioner of Public Works and other interested persons will be invited to consider the matter. It appears that the citizens interested have brought a friendly suit in the Appellate Division of the Supreme Court at Albany for a mandamus to compel the Railroad Commissioners to reopen the hearing on the application for a change of motive power.

Norfolk, Va.—The Norfolk Street Railroad Co. proposes to sell to a syndicate of Baltimore and Richmond capitalists a large part of the stock of the Norfolk Street Railroad Co.

Philadelphia.—Six property owners in the vicinity of Thirteenth and Mt. Vernon streets, Philadelphia, have brought suit against the Philadelphia Traction Co. to recover damages for alleged injuries to their properties by the vibration and noise of the machinery in the power house at the intersection of those streets.

Pittsburgh.—Mr. A. H. Kerr and others have filed a bill in equity against the Pittsburgh, Neville Island & Corapolis Street Railway Co., asking that the defendant be restrained from operating its cars over the island and that it be compelled to remove its tracks. They claim that permission was never given by some of the property owners along the route to build the road.

Southington, Conn.—The controlling interest in the Southington & Plantsville Tramway Co. has passed into the hands of the secretary, Mr. R. T. Ives. The road is about two miles in length and has an outstand-

ing capital stock of \$20,000 and the same amount of bonded debt. Last year there was a deficit of \$227.

Washington, D. C.—Preliminary proceedings are in progress which will probably result in the change of control of the Columbia & Maryland Railroad Co., which has been partially completed as an electric line with very substantial roadbed construction. The company was recently reorganized as noted in this column, and it was evidently intended to complete the road as an electric line. Mr. John E. Searles, of New York, who is interested in the syndicate which will probably secure complete control, states that the transactions have not yet been completed, and preferred not to make a statement until the details had been arranged.

TRAFFIC.

Traffic Notes.

The Lone Star steamship line has made a further serious reduction in freight rates from New York to Colorado by way of Galveston.

Commercial travelers in Michigan are getting up a petition to the Governor of the State asking him to call a special session of the Legislature to enact a law reducing all passenger fares to two cents a mile.

The Northern Pacific has reduced freight rates on hay and feed from St. Paul and Duluth to Western Dakota and Montana to one cent per ton per mile. This is to favor the stock raisers, whose grass crop was greatly damaged by dry weather during the past summer.

A decision of the Interstate Commerce Commission was rendered Nov. 19, in what is known as the Omaha bridge case, brought by the Commercial Club of Omaha against the Chicago & Northwestern and other roads. The suit was to compel the carriers to charge between Omaha and points in Iowa no more than they charge on like freights between Council Bluffs and the same points in Iowa. The commission decides that Council Bluffs, on the east side of the Missouri River, is more favorably situated than Omaha, on the west side of that river, in regard to traffic with points in Iowa, and that the carriers are not to be condemned for recognizing such natural advantage of location in adjusting their charges; nor does it follow that rates should be the same from Omaha and Council Bluffs into Iowa because they are the same from those cities into Nebraska. In view of the conditions affecting transportation to and from points in Iowa, and of the whole rate situation of the two places, the commission holds that the charge of unjust discrimination against Omaha is not sustained and that the complaint should be dismissed without prejudice. Commissioners Morrison and Clements filed a dissenting opinion.

Nashville Centennial Traffic.

During the term of the Tennessee Centennial Exposition at Nashville, which was recently closed, the Nashville, Chattanooga & St. Louis Railroad ran 4,635 passenger trains, as follows: Chattanooga Division, 1,424 regular, 771 special; Northwestern Division, 1,458 regular, 380 special; Lebanon Branch, 532 regular, 64 special. The number of passengers carried over the road on special tickets has not yet been footed up, but the gradual increase of traffic as the Exposition drew to a close is said to be fairly indicated by the sales of tickets at individual stations. For instance, at Cowan the sales during the month of April amounted to 10; May, 63; June, 70; July, 113; August, 132; September, 267; October, 744. At Murfreesboro, 33 miles from Nashville, the number of Centennial tickets sold was 14,699. The population of this town is only 3,000. From Chattanooga, 151 miles from Nashville, 11,269 tickets were sold.

Aside from the regular passenger business, this road ran very frequent trains between the Union station at Nashville and the Centennial grounds, about two miles, during the entire period of the Exposition. Over 11,000 of these trains were run and the number of passengers carried on them was 481,425. About 30 per cent of the whole amount of gate receipts at the Exposition was taken at the terminal station entrance where these trains deposited their passengers. The fare on these trains was 5 cents. Excursion fares over the road from points outside of Nashville were very low. Major J. W. Thomas, President of the road, was President of the Exposition. Not a single passenger was injured on this road during the six months of the Exposition.

Chicago Traffic Matters.

CHICAGO, Nov. 24, 1897.

The eastbound rate situation out of Chicago is to be investigated by the Presidents of the Chicago-New York lines, who are to meet in this city about the 29th inst. The situation as it exists to-day is one of demoralization, all eastbound freight rates being in bad shape. The Pennsylvania is said in this instance to have been the aggressor. It found some justification, however, in the fact that the Grand Trunk made independent rates very freely.

Colorado rates took a third tumble inside of a week on Saturday last, the steamship lines via the Gulf and the Union Pacific, Denver & Gulf road meeting the new tariffs of the Western lines as fast as they were published. The last tariff announced applies from Chicago to Denver, Colorado Springs, Pueblo and Trinidad only, and is as follows:

Rate.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	119	95	47	32	27	32	27½	25	25	25

The establishment of a new line of Oceanic steamers from Port Arthur, on the Gulf, to Liverpool, Amsterdam and Rotterdam in connection with the Kansas City, Pittsburgh & Gulf road is causing the Western Passenger Association some uneasiness for fear it will upset the new immigrant agreement.

The past week has seen a merry time in passenger rates between this city and St. Paul and Minneapolis. The Wisconsin Central, after repeated warnings to the strong lines that it would not stand their taking business at any price, on Friday cut the rate from \$11.50 to \$8 between Chicago and the Twin Cities, making it good in both directions. All the other lines at once met the cut, and the matter has been referred to the executive officers who will try to get the rate back to normal basis.

The Western roads have refused to agree to the proposition submitted by the Joint Traffic lines for a division of through rates from the Northwest to enable the trunk lines to meet Soo competition.

The Western Passenger Association lines have agreed to restore the payment of normal commissions on business to and from the Pacific coast.

Lines in the Central Passenger Association have agreed to make a rate of one cent a mile for the G. A. R. encampment at Cincinnati next summer, and have recommended to the Joint Traffic Association that the same rate be made to apply from trunk line territory.

Western roads have agreed that on and after Jan. 1, 1898, all car ferry lines shall pay the same rate for car mileage as is paid by the railroads under the car service rules.